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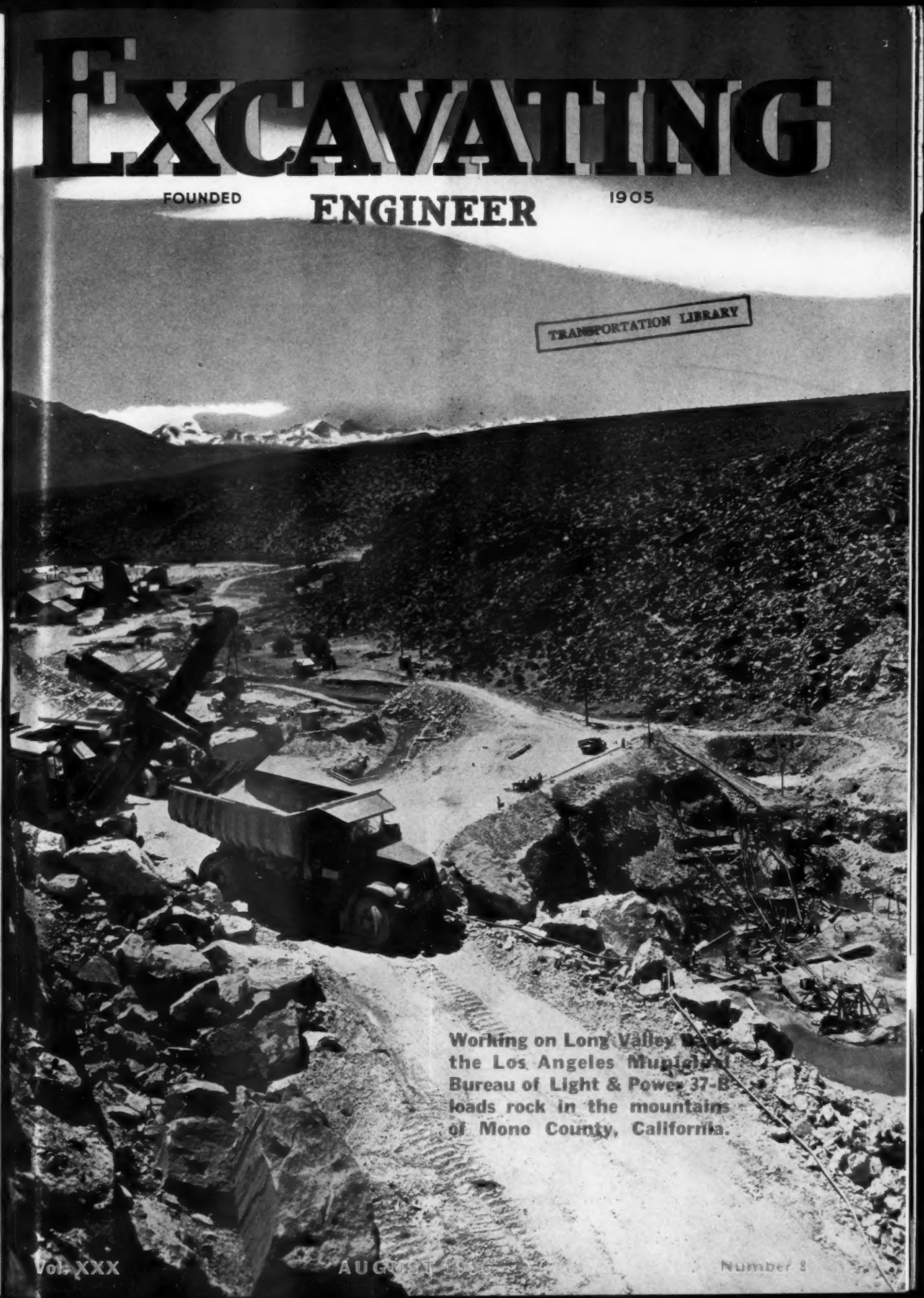

Working on Long Valley Dam for the Los Angeles Municipal Bureau of Light & Power 37-B loads rock in the mountains of Mono County, California.

Vol. XXX AUGUST 1958 Number 8

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EXCAVATING ENGINEER

FOUNDED 1905

DEVOTED EXCLUSIVELY TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 **AUGUST, 1936** **No. 8**

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Looking Ahead

These interesting articles will appear in early issues of Excavating Engineer. Watch for them!

Building Fort Peck Dam

Dredging operations for the earth fill core, diversion tunnel construction, and the excavation for the spillway will be presented in a series of articles starting in an early issue.

Salt from the Desert

Not far from famous Death Valley, and 200 miles northeast of Los Angeles lies the city of Nona. Here the American Potash and Chemical Corporation refines saline products taken from Searles Lake—composed of salt, not water. Interesting work, and an interesting job for a 1¼-yard shovel.

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F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

Regular subscription: 25 cents per copy, $1.00 a year; Canada and foreign, subject to publication policy, $2.00 per year. Special subscription: Upon application on card inserted in this number, this publication will be sent frequently (not regularly) free of charge, to companies, executives and supervisors engaged actively in the industry of excavation.

D. B. REED, JR.
Assistant Editor

E. M. HEUSTON
Advertising Manager

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Not in the Contract

Son: "Say, dad, what does it mean when the paper says some man went to a convention as a delegate-at-large?"

Dad: "It means his wife didn't go with him, son."

First Girl Hiker: "I inserted an advertisement in our local newspaper recently under a box-number for a male partner to accompany me on a fortnight's hiking trip."

Second Girl: "How interesting. Did you have many replies?"

First Girl: "Yes, hundreds, but there was a terrible row in the house over it."

Second Girl: "Good gracious, why?"

First Girl: "Father was one of the applicants!"

"Can I trust him?"

"Why, he's so crooked that the wool he pulls over your eyes is half cotton."

Edna: "How did you get the mark on your cheek, Helen?"

Helen: "The boss had his pen behind his ear when he said 'Good Morning' to me."

Teacher: "Now if I lay three eggs here and five eggs here, how many eggs will I have?"

Skeptical Pupil: "I don't think you can do it."

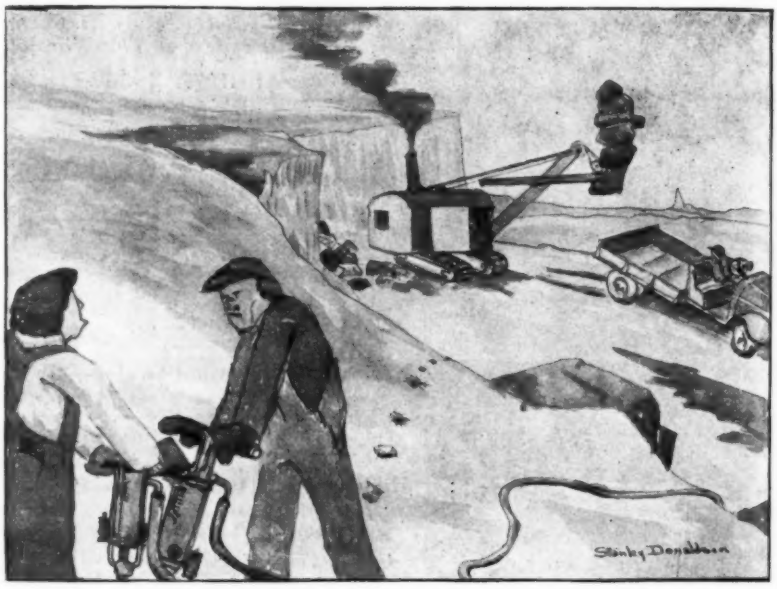
Old Lady: "I wouldn't cry like that, my little man."

Boy: "Cry as you damn please; this is my way."

A mountain man, who rarely, if ever, visited a town of any size, came to a city with his son, traveling in a rattletrap car.

Climbing out on one of the main streets, the old man appeared fascinated by the pavement. He scraped his feet on the hard surface, and, turning to his son, remarked:

"Well, I don't blame 'em for building a town here. The ground is too darn hard to plough, anyhow."



"He used to be a waiter at the Ritz."

An old time oiler went into a store to buy a shirt and the clerk tried to sell him a trunk also.

"What would I use a trunk for."

"To keep your clothes in."

"Say, do you want me to run around naked?"

Neighbor Lady: Willie, I need a dozen eggs from the store. Do you suppose you could go for me?

Willie: No, but I heard Pa say that he could.

"Shut that door! Where were you brought up—in a barn?"

The man addressed complied meekly and silently. The first speaker observed that he was in tears, and going over to the man he apologized.

"Oh, come," he said, soothingly, "you shouldn't take it to heart because I asked if you were raised in a barn."

"That's it, that's it," sobbed the other. "I was brought up in a barn, and it makes me homesick every time I hear an ass bray."

"Do you believe in clubs for women?" asked the reporter of the local newspaper, interviewing the visiting celebrity.

"Yes," he replied judiciously, "if kindness fails."

The young bride was extolling the virtue of her husband to a friend.

"George is just the most generous man in the world," she declared. "He gives me everything credit can buy."

Texas Highway sign: "This is God's country. Don't drive like hell."

"Mr. Smith, I saw your wife kiss the iceman this morning."

"Great Scott, wasting her time on him when we owe the grocer ten dollars."

In a nationally-famous hotel, the class in service was under way. The instructor had asked several to explain the difference between courtesy and tact. The response was nil. So he turned to a little negro bell-hop and said: "You take a shot at it, Sam."

"Well," said Sam, "las' week Ah was in a room. An' when Ah opens de bathroom doh, Lawdy, dey's a lady in de tub. So Ah shuts de doh quick an' Ah says, "Excuse me, suh!" "Now," Sam went on, "as Ah sees it, de 'Excuse me' wuz courtesy. But de 'sir' wuz tact!"

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Cordeau-Bickford Detonating Fuse is manufactured with the same precision that has made Ensign-Bickford Safety Fuse famous for more than 100 years. Let us send you a copy of our Centennial Book—and tell you more about Cordeau.

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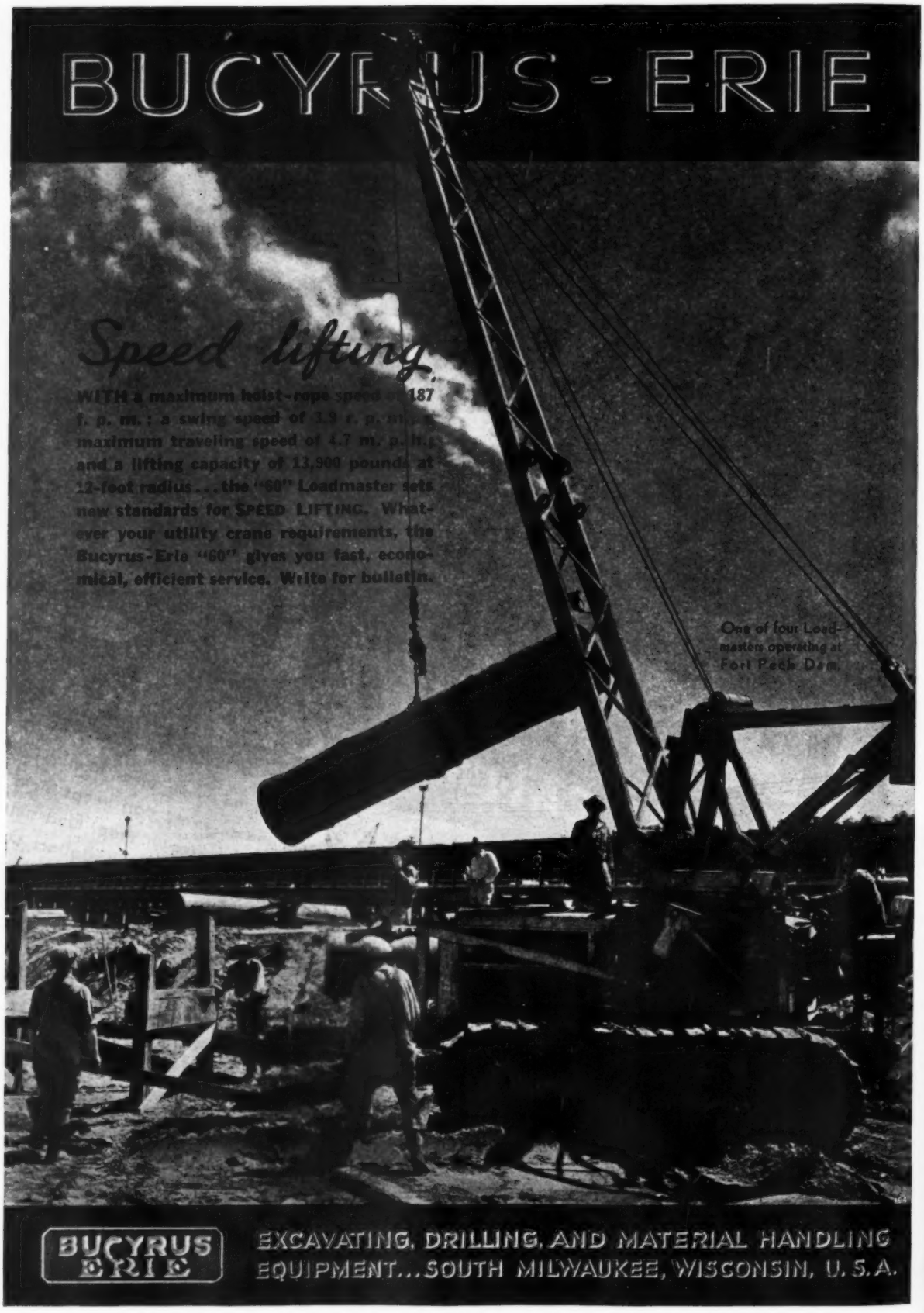
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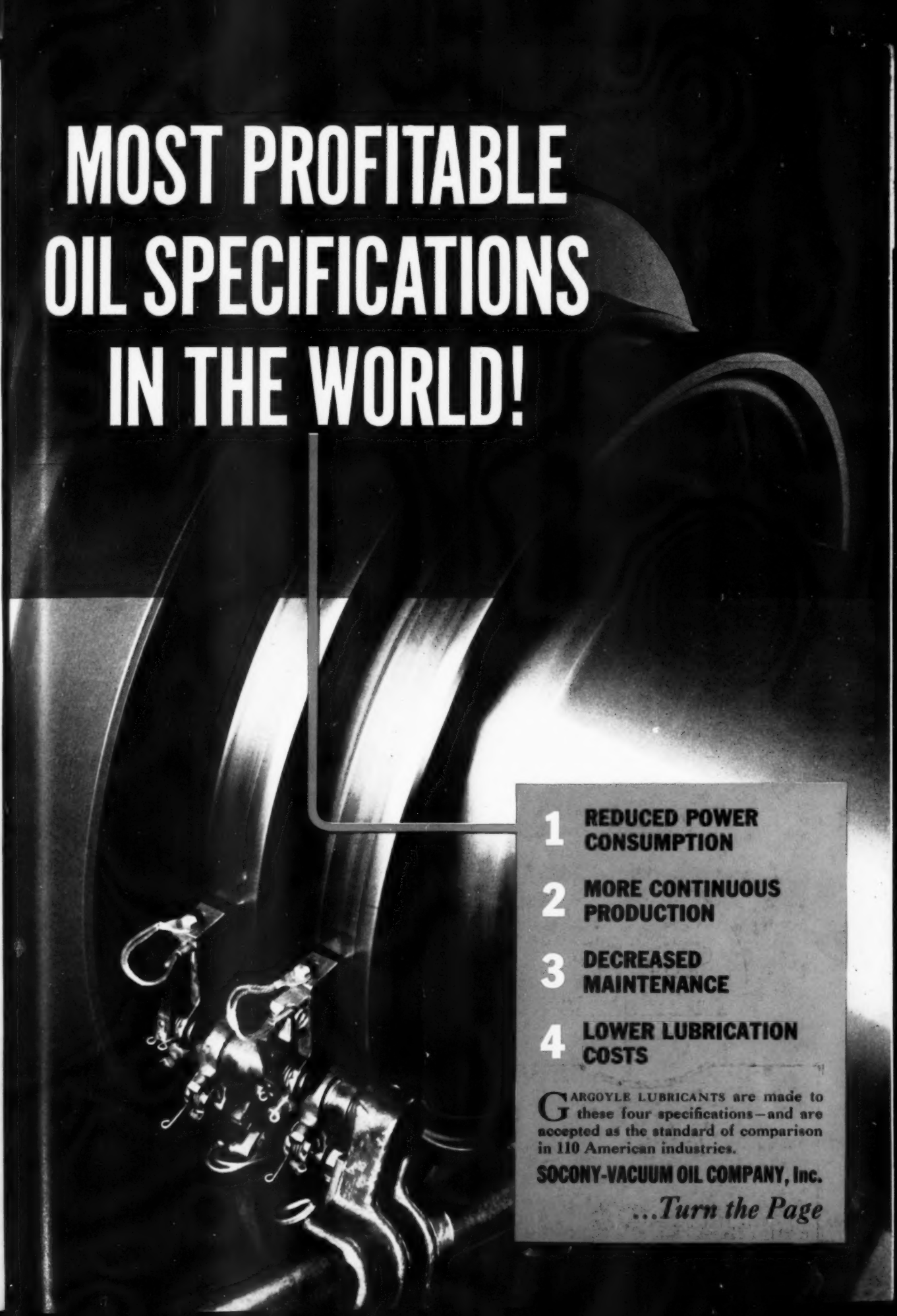

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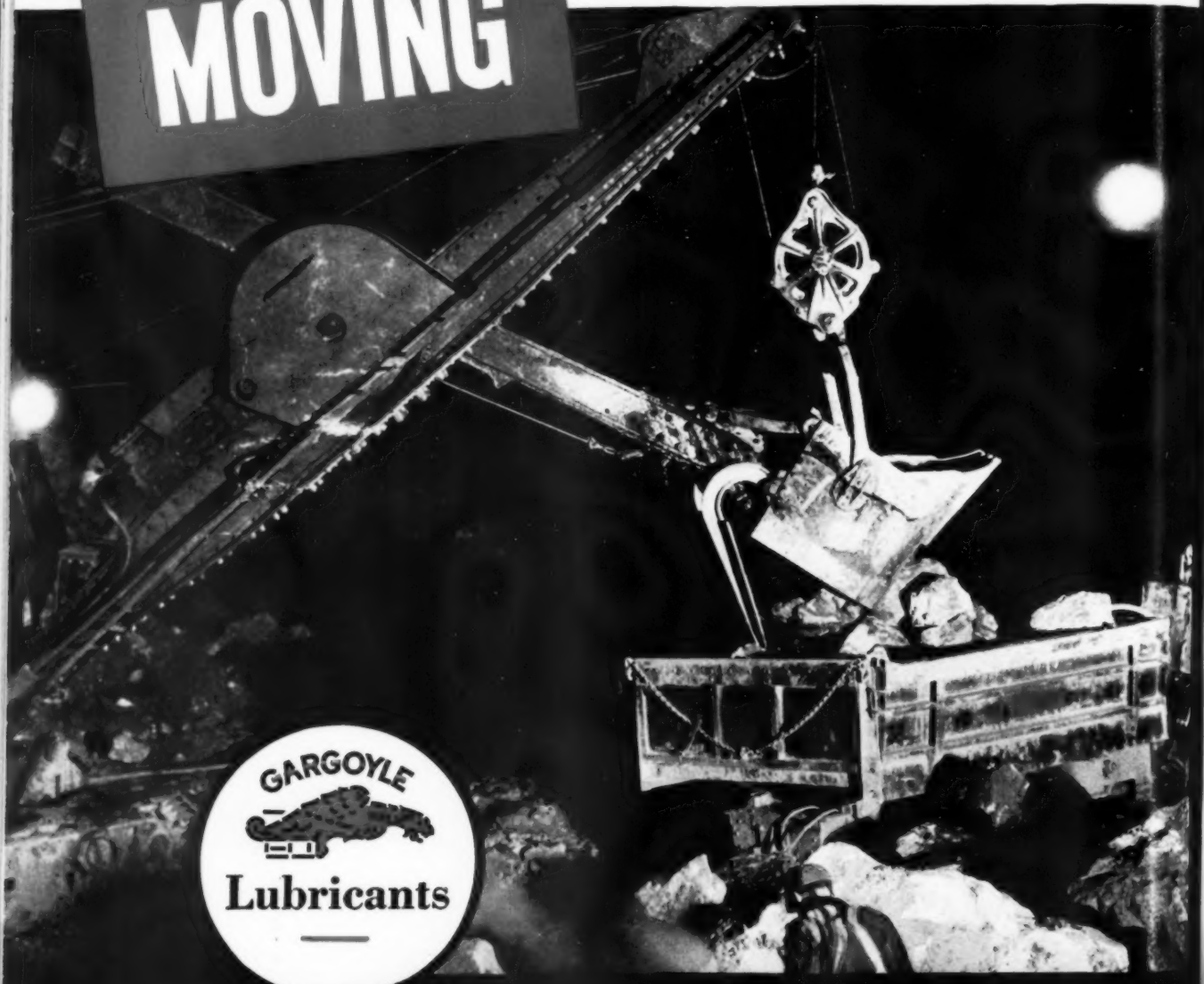

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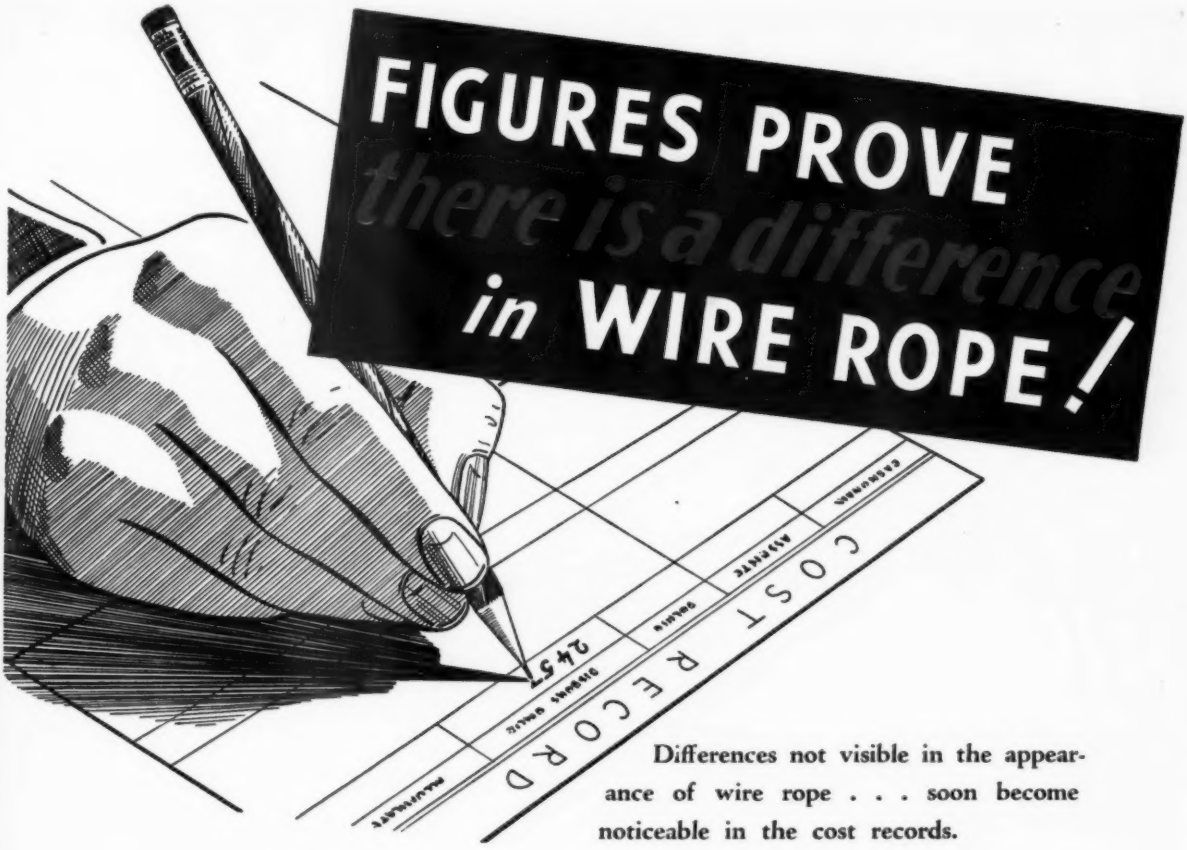

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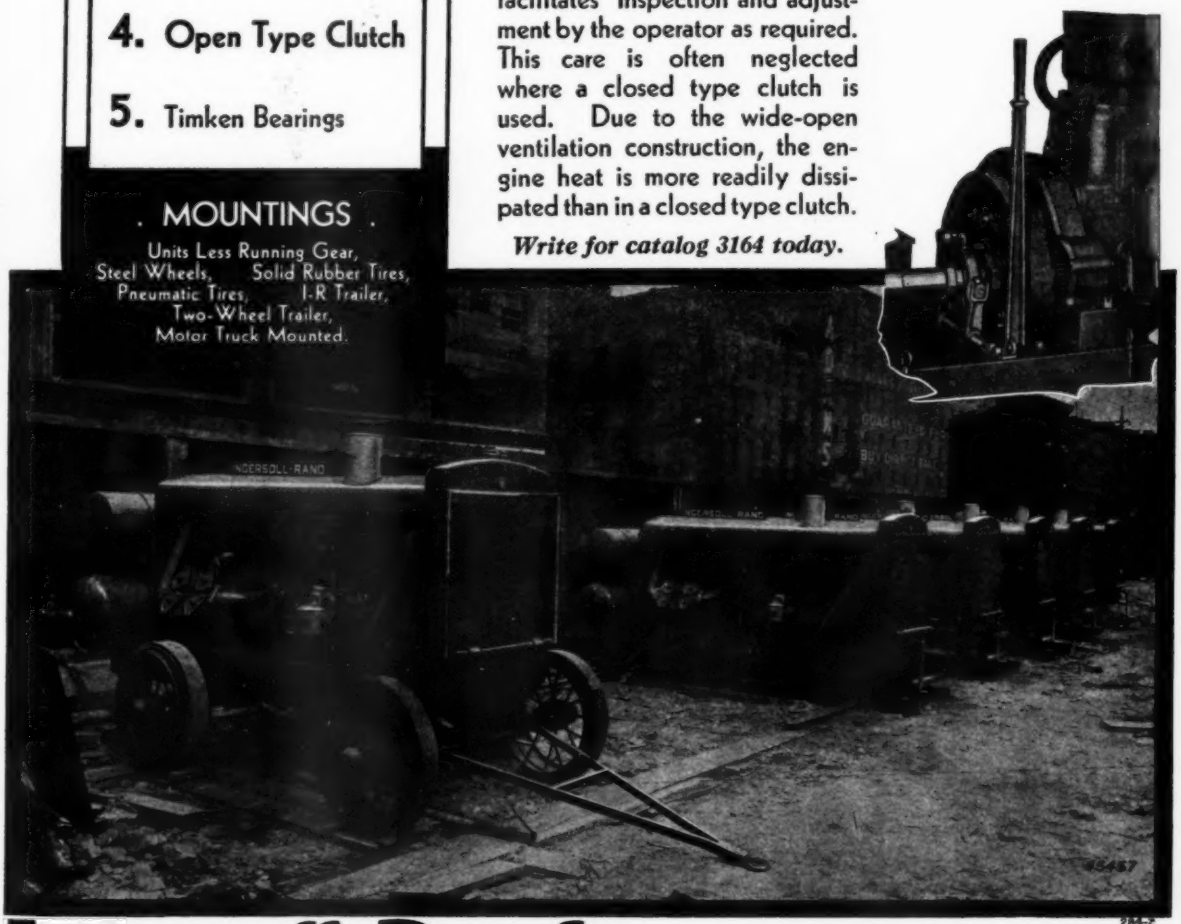

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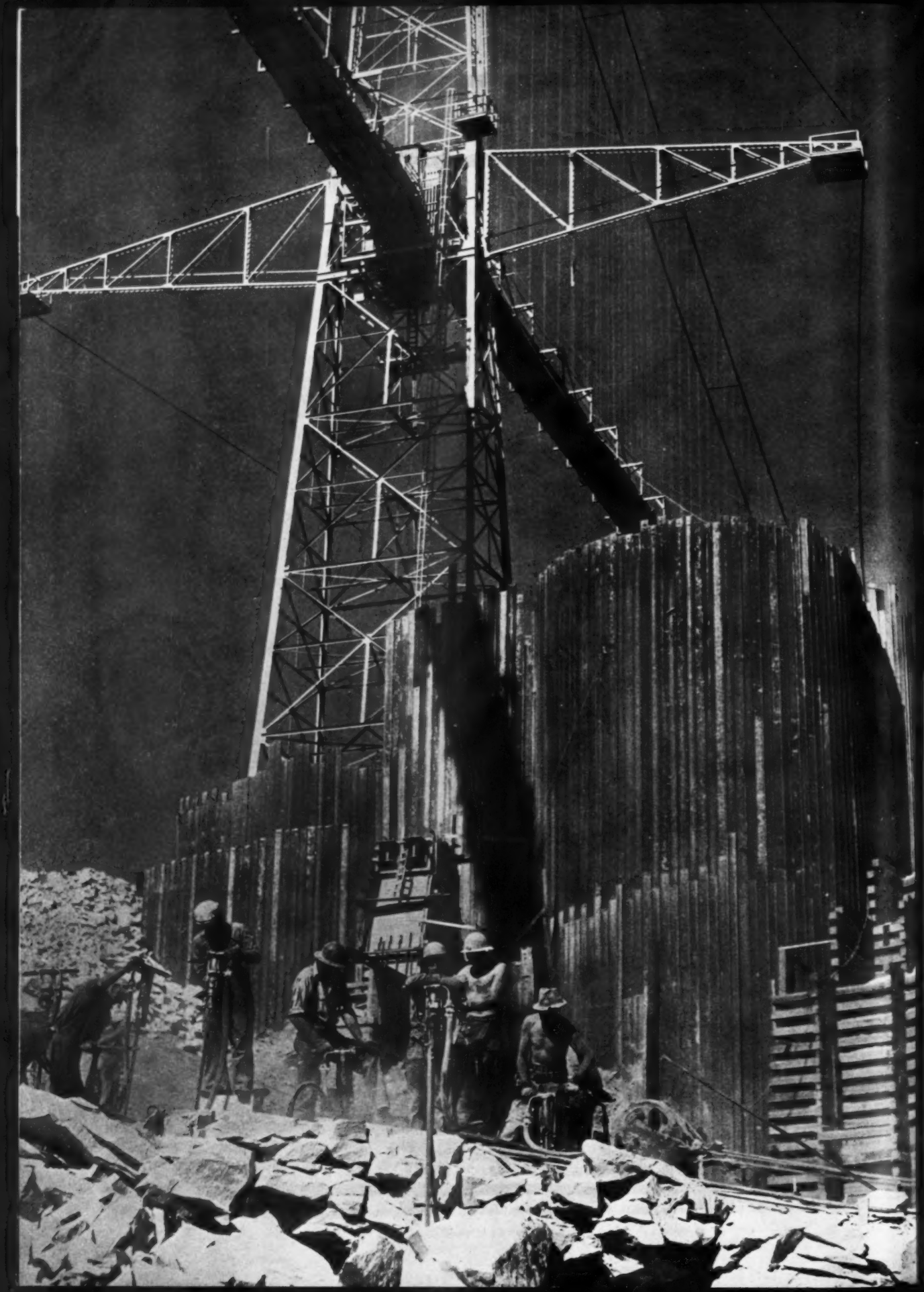


EXCAVATING
ENGINEER
AUGUST, 1936 VOLUME XXX NO. 8

Excavating for Grand Coulee

Over 17,000,000 yards moved more than a mile by MWAK in building base section of world's largest concrete dam.

By HENRY W. YOUNG

ABOUT 95 miles west of Spokane, Washington, the Columbia River makes a big bend, near the upstream end of which is Grand Coulee. Formed by the river, diverted from its course by a glacier, this dry valley is about 50 miles long, ranges up to 5 miles wide, and has towering rock walls 900 feet high. When the irrigation and power project now under way is finally completed, Grand Coulee will be a storage reservoir from which two main canals, each over 100 miles long, will irrigate 1,200,000 fertile acres in the Columbia Basin. Electric power generated at the main dam will be more than sufficient to adequately serve the surrounding region.

The Grand Coulee Dam became more than a dream when, in 1933, President Roosevelt asked PWA to allocate $63,000,000 to the project.

• On the opposite page is shown one of the towers of the suspension bridge carrying the belt conveyor which moves aggregate from the east bank pit to the west bank mixing plant. In the center is a section of the steel sheet piling cofferdam. The photograph above is a night view of west cofferdam excavation area. Work was handled in three seven hour shifts.

Preliminary Contracts and Construction

Since an immediate purpose was to provide emergency employment, the Bureau of Reclamation was faced with the need to start at once. Core drilling had located, with reasonable accuracy, the logical axis for the dam and, in December 1933, the first excavation contract was let. This called for removing of 2,040,000 yards of earth and rock overburden from the damsite, and was awarded to David H. Ryan of San Diego on his bid of $534,500. The work was completed in June, 1934, using power shovels loading to trucks and crawler wagons.

Other early contracts were awarded to the Crick & Kuney Company of Spokane for grading and structures for highway and construction railroad in the coulee, $220,676.50; the Western Construction Company of Seattle for construction of concrete piers for Columbia River bridge, $180,177.40; and S. H. Newell & Company of Portland for grading streets at the government camp site.

The Washington Department of

• *The west bank excavation as it looked under the shadow of an airplane wing. The west abutment will be fastened to the granite just below the bend in the road. The portion at the top of the bank resembling a horseshoe is the slide area.*

Highways built a 30-foot highway from Coulee City to the damsite, a distance of 31 miles. David H. Ryan was awarded a contract to build the U. S. construction railroad a distance of 30 miles from Odair, a Northern Pacific siding about two miles north of Coulee City, to the damsite for $235,570.

On June 18, 1934, bids were opened for construction of the dam and power plant. Contract was awarded to Mason-Walsh-Atkinson-Kier Company on its bid of $29,339,301.50. This concern was formed by a combination of the Silas Mason Company of New York, Walsh Construction Company of Davenport, Iowa, and Atkinson-Kier Company of San Francisco. The late Silas Mason was Chairman of MWAK, and the directors voted to leave that office vacant out of respect for his memory. T. J. Walsh is president of MWAK; Guy F. Atkinson, 1st vice-president; Sam A. Mason, vice-president and treasurer; A. G. Moulton and M. J. Whitson, vice-presidents; E. L. Kier, secretary; John J. Walsh, assistant secretary.

Plans Changed After Work Was Started

Plans when this contract was awarded called for a concrete, straight gravity low dam costing $42,000,000, and a power plant costing $21,000,000. However, in June 1935, a change in plan was approved which called for spending the entire $63,000,000 allocated on a base section of the "high," or ultimate dam, with no immediate provision for power plant. Final cost of the high dam, authorized by Congress, will be $200,000,000, and complete cost of the whole project, including additional dams at either end of Grand Coulee, power plant, and irrigation canals has been estimated at between $394,000,000 and $400,000,000. Only the base section of the main dam, however, is under way at present.

When completed, Grand Coulee Dam structure will be roughly three times the size of Boulder Dam, now the largest concrete dam in the world.

About the Dam

The dam for which the base section is now being built will be a concrete, straight gravity type, made up of a central 1,650-foot uncontrolled spillway and flanking abutment sections. Maximum height will be 550 feet, top length, 4,300 feet, top width, 30 feet. A 26-foot roadway will be carried across the spillway by a bridge with 11 spans. Water will be pumped from the level to which it is raised by the dam 300 feet higher into the Grand Coulee reservoir.

The base section, which is now being constructed under the changed plans, will be 440 feet thick at the base and will be built to a height two feet above average low water. Approximately the same amount of concrete (3,500,000 cu. yds.) will be required for the base as would have been required for the low dam, but the change increased necessary foundation excavation about 2,000,000 yards.

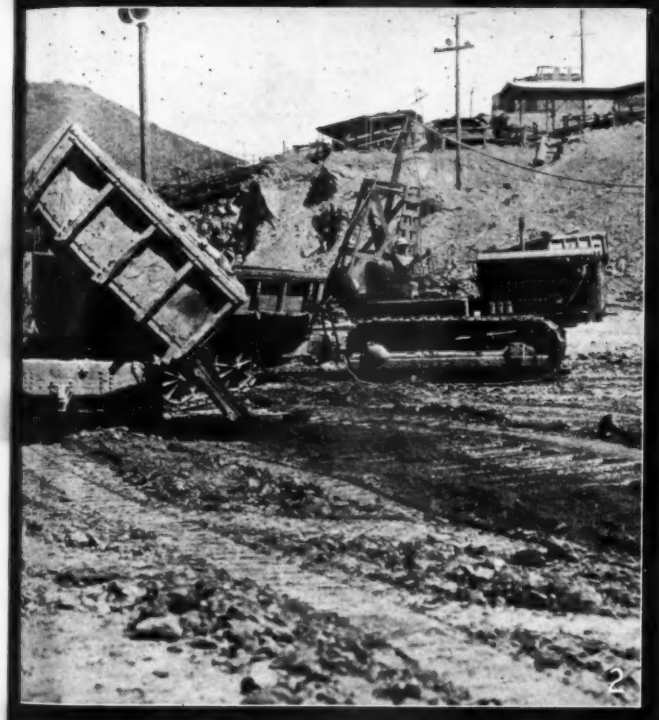
With Speed the Watchword

Before operations could be begun at the damsite, much preliminary work had to be done, and done fast. It was! A 31-mile 110,000-volt transmission line was built from Washington Water Power Company lines at Coulee City in 42 days. Mason City, the camp built on the east bank of the river was put up with record speed. The houses are painted and set in orderly rows about Mead Circle. Concrete foundations, interiors finished with insulating panelboard and use of electricity for all heating, cooking, and lighting make the settlement more like a modern city than a camp. For a stipulated price, the government can take over camp and power line if it so desires upon completion of the contract.

Houses of varying size for married workers, as well as dormitories are provided both in Mason City and in the attractive permanent government employees' town across the river. A bank, post

• *This general view of the west pit shows clear-up work behind the cofferdam. The line of men at the right are jackhammer crews.*

1



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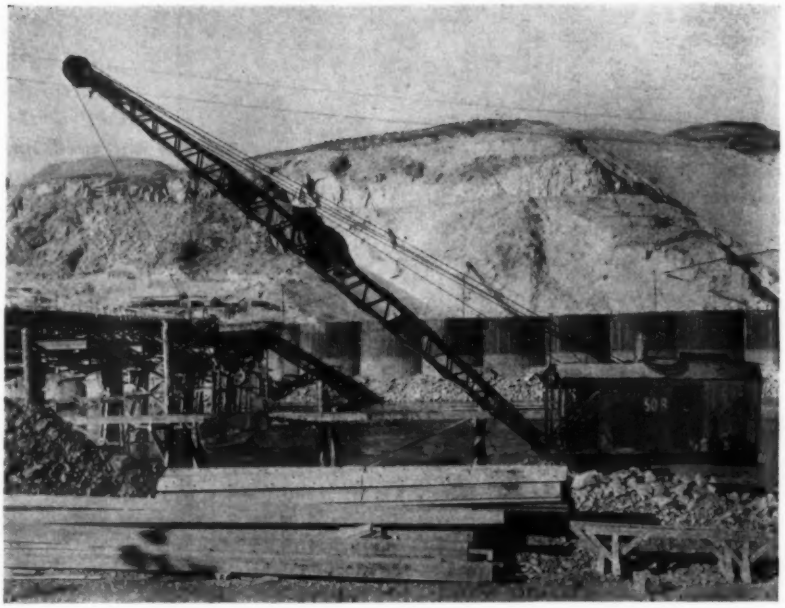
3

The Progress of the Dirt

(1) A heaping five-yard dipper goes from bank to tractor-drawn crawler wagon. Six electric shovels handled the heavy excavation. (2) Wagons are dumped on heavy grizzlies of I-beam steel. Bulldozers swing in to crush material between bars and move oversize rock aside. (3) Beneath the grizzly, an apron conveyor takes the dirt, moves it to one of four feeder conveyors. A central surge feeder keeps the main belt full, as shown here. (4) A special stacker boom wastes the dirt in a canyon a mile from the excavation. It swings through a horizontal arc of 180 degrees. (5) Bulldozers shape the material in place in Rattlesnake Canyon —over 2,000 bank yards an hour went into building this young mountain.

4

5



• MWAK machine number 1. This veteran Bucyrus-Erie 50-B Diesel dragline was the first of the company's great fleet of equipment on this job. It is shown excavating the trench for starting the piling for the east cofferdam.

office, department store, theater, hotel, garage, and shops are all to be found. Mason City has a high school and a school embracing the first three grades. The upper five grades are taught in a school in the government camp. Two churches and a well-staffed and fully equipped hospital complete the list of buildings.

All together, little that goes to make up the service and convenience of modern city life is missing from these "camps."

Fitting the Plans to the Job

The very size of the excavating job to be done, within the time limit required, rather than unusual features of it, constituted the chief problem faced by MWAK. Plans were laid with a speed and foresight which stand as a remarkable tribute to the contractor's organization and the manufacturers associated with them.

When the situation at the damsite was studied, it was found the best dump for the excavated material was Rattlesnake Canyon, about a mile from the west bank excavation. However, the floor of the canyon was 150 feet, and its rim about 400 feet, above the river level. In addition, steep cliffs forming the river bank made the canyon practically inaccessible to trucks and ordinary hauling equipment.

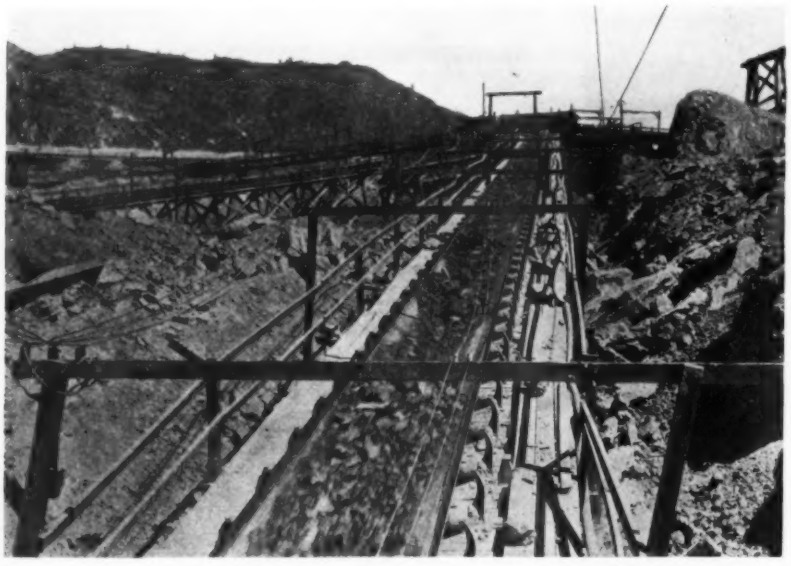
Belt conveyors seemed the only logical answer, and fortunately, the Silas Mason Company had used them to haul and waste excavated material on two previous contracts, the Boston Vehicular Tunnel and the diversion tunnels at Fort Peck, handled in partnership with the Walsh Construction Company. It was determined to use the same method at Grand Coulee. Since the problems and scope of the job were much different from either of the tunnel contracts, a belt conveyor system had to be "tailor-made." Flexibility was of first importance, and the conveyor had to be rugged and safe for use by men not skilled in its operation.

To Haul and Waste the Dirt

The Jeffrey Manufacturing Company of Columbus, Ohio, represented on the job by Stanley Mercier, worked with MWAK to such good effect that the conveyor system was designed, manufactured and installed in the remarkable time of 2½ months. Briefly, the system consists of four converging or "tributary" conveyors in the excavation area, a mobile conveyor stacker at the dumping end, Rattlesnake Canyon, and a long main line conveyor connecting these two extreme points.

The stacker actually consists of three 60-inch belt conveyor units as follows:

1. An extensible conveyor that is added to in 50-ft. belt sections as the dump progresses and whose head end is supported on a 50-foot-long four wheel truck which straddles the second unit.
2. A telescopic unit whose foot end is located under the head or discharge end of the first unit and



• Four branch "feeders" carried the dirt from the pit to a central surge feeder, shown top right center, which fed the material to the main belt so as to keep it carrying constantly at capacity.

• The hauling equipment kept up a continual circle from shovels to grizzlies and back again. Note how the two Athey 7-yard wagons are ready to move up as soon as the Caterpillar 75 hauls the full "train" away.

arranged to travel freely through a distance of 50 feet, receiving its load from the first unit at any point in this range.

3. A 175-foot conveyor boom which receives the discharge from the second unit. This boom, through an angle of 180 degrees, is wheel-track supported at its pivot point and mounted on Bucyrus-Erie caterpillar type traction about two-thirds of its length out.

The main conveyor line, which attained a length of roughly a mile at maximum extension, is composed of 60-inch belt, ¾ inch thick, running on Jeffrey idlers equipped with Timken bearings. Certain of these are of standard duty specifications, others of heavy duty, and still others have rubber-covered rolls, used in impact discharge zones.

The tributary conveyors, spread fan-wise into the excavation area, discharge into a central surge feeder which keeps the main belt carrying constantly at capacity. These tributary sections, inclined at 7 per cent initially, have handled the material successfully on grades up to 26 per cent.

The receiving units of the feeder or tributary conveyors are extra rugged steel apron conveyors with 40-yard hoppers which take material from dumping equipment through grizzlies of heavy I-beam steel. Instead of customary chutes, material is transferred between sections through a special system of baffles. As the excavation progresses the receiving units are moved to lower levels as needed. They are provided with steel runners, and are moved by three tractors.

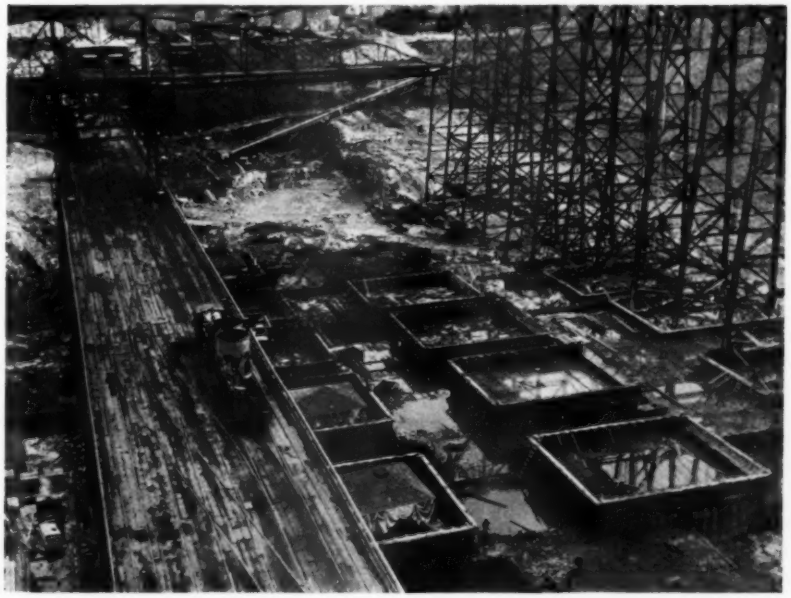
The theoretical capacity of the main conveyor is 2,500 bank yards (4,000 tons) per hour. Record run for 21 consecutive hours was 50,700 bank yards, an average of 2,414 yards per hour. In a single 7 hour shift, 18,000 yards, or 2,572 yards per hour were handled. Average daily run has been about 40,000 yards, with average operating time about 93 per cent of possible time.

The entire conveyor system is electrically controlled, and provided with automatic sequence starting from stacker boom back to tributary belts. The feeders themselves are started by hand, but so arranged that they cannot be started unless the belt is in full operation. Thirty-two electric motors, totaling 5,195 h.p. are used on the system.

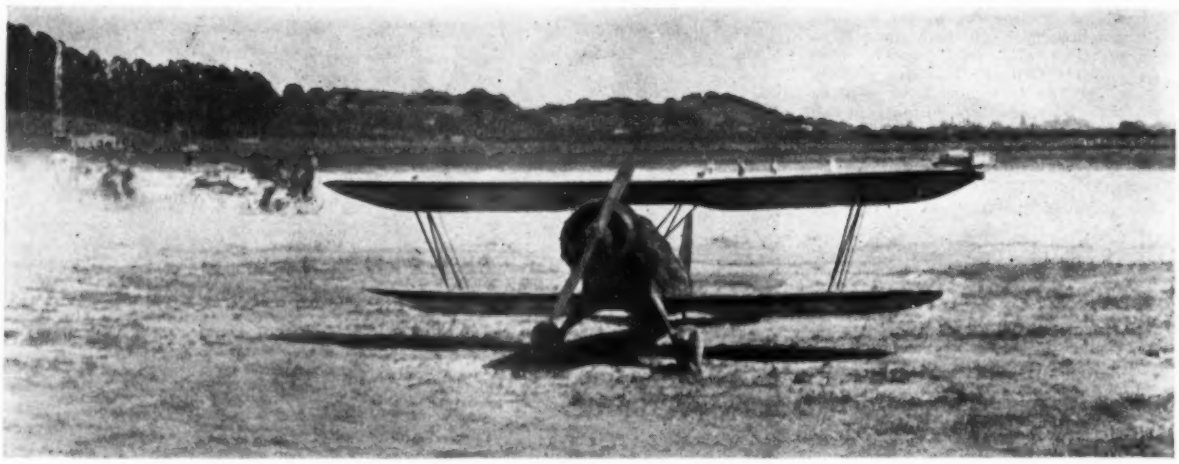
Emergency and regular stop buttons are provided at easily accessible points all along the line. Stoppage of any unit, from any cause, automatically stops all units behind it, but does not interfere with those between it and the dump. For further safety, the entire line is well lighted. Safety instructions are prominently posted, and moving parts are guarded as fully as possible.

Maintenance is handled chiefly

(Continued on page 432)



• One of the Diesel locomotives pulls a car of concrete out on the trestle from which Block 40 is being poured. The cofferdam which will divert the river will be anchored to this block. That's the next step in the work.



High Outputs Under Oath

New 10-B Bucyrus-Erie Shovel Digs Such High Yardages for Krusze, Crane & Cox It's Hard to Believe They Were Obtained Using 3/8-Yard Shovel

***By* D. W. EVANS**

ON JOBS requiring hauling dirt a mile or so in trucks we would expect outputs from a 3/8 yard shovel to run perhaps 300 to 350 yards per day under exceptionally favorable conditions. Yardage obtained by Krusze, Crane & Cox of Healdsburg, California, from their new 3/8 cubic yard Bucyrus-Erie 10-B shovel is so high it seems advisable to put the witnesses under oath.

COURT CLERK: Next case concerns yardages moved on Santa Rosa Airport and other jobs in Sonoma County in the spring of 1936.

JUDGE: The witness is now under oath. Name the culprits.

The Men Behind the Output

WITNESS: Your Honor, their firm name is KRUSZE, CRANE & COX. Harold E. von Krusze has been in the hauling business around here for several years. He's had both good luck and bad, and lately formed a partnership with these other two to buy the shovel that has been digging up so much dirt. F. L. (Lester) Crane has been running shovels for other people as far back as we can remember. Now he owns and runs this new shovel and it is probably his fault that this case has come to court. V. L. "Lee" Cox went into partnership with Krusze on a hauling job at Jenner a while back, and now he and the other two are equal partners.

The Testimony

JUDGE: The record here states that Lee Crane moved 582 cubic yards bank measure in eight hours on a job for the County.

WITNESS: Your Honor, that's true. This was the second day Les Crane ran the shovel after it was first delivered, and he hadn't really gotten used to the machine. The yardage was excavated from a borrow pit and used to replace a fill washed out during the rainy season. It was measured in place in the fill. Ed Peugh, the County Surveyor, paid the contractors and his records prove it.

JUDGE: Well, that sounds fair enough. But here it says this 3/8-yard shovel moved 716 cubic yards in 7¾ hours.

WITNESS: Your Honor, that is a true statement too. That is a record of compacted fill in place and it was an actual check with a stop watch which we undertook to make because of the high yardage that was being handled by such a small shovel. There is no

• *Short tail swing and general compactness are very useful in close quarters as shown here. Loading one of the 3½ yard Ford trucks—the five trucks haul better than 3500 yards per week away from the shovel on the mile haul to the airport.*

•Les Crane, one of the partners of Krusze, Crane & Cox, at the levers of the Bucyrus-Erie 10-B shovel. He can consistently average a dipperful every 9 seconds on a quarter swing to the truck shown just behind the shovel.

mistake in the record there because it has been double checked.

JUDGE: Are there any other output figures for this shovel?

WITNESS: Yes, Your Honor. Les Crane is now running the shovel just outside of Santa Rosa on the WPA improvement job for the municipal airport. Krusze, Crane & Cox, own two Ford trucks with 3½-yard dump bodies on them, and besides they have three 3½-yard trucks rented. The five trucks are being loaded by the Bucyrus-Erie shovel and have to haul a mile to the airport. We have checked up several times and find the shovel is loading 20 to 25 trucks an hour.

JUDGE: Do you mean to tell me this shovel is loading 70 cubic yards an hour? That would mean a dipper full every 20 seconds.

WITNESS: Well, Your Honor, we find on a quarter swing that the shovel actually loads a dipperfull every 9 seconds but of course there are delays for trucks to pull out and back in. They hired another truck so there would be less waiting for the shovel.

• The borrow pit from which material is removed for fill for the Santa Rosa Airport. The material is a cemented volcanic ash. Here we see the 10-B loading one of the contractors' own Ford 3½ yard dump trucks.

JUDGE: Are there other delays encountered on this job?

WITNESS: Yes, Your Honor. You see, the material this shovel is digging is a volcanic ash which has solidified and they have to drill and shoot it whenever the shovel has excavated all the loose material.

Proof—and Verdict

JUDGE: Are there any official records of outputs on this job?

WITNESS: There are, Your Honor. We will introduce as evidence this statement from the Works Progress Administration. It shows a record for a period of one week, from actual measurement by the engineers. The shovel worked 6 days, 9 hours per day, including delays for drilling and shooting. The yardage was 3757½ cubic yards paid for at 29½ cents per yard. That is an average of 626 yards per nine hour day including all stops.

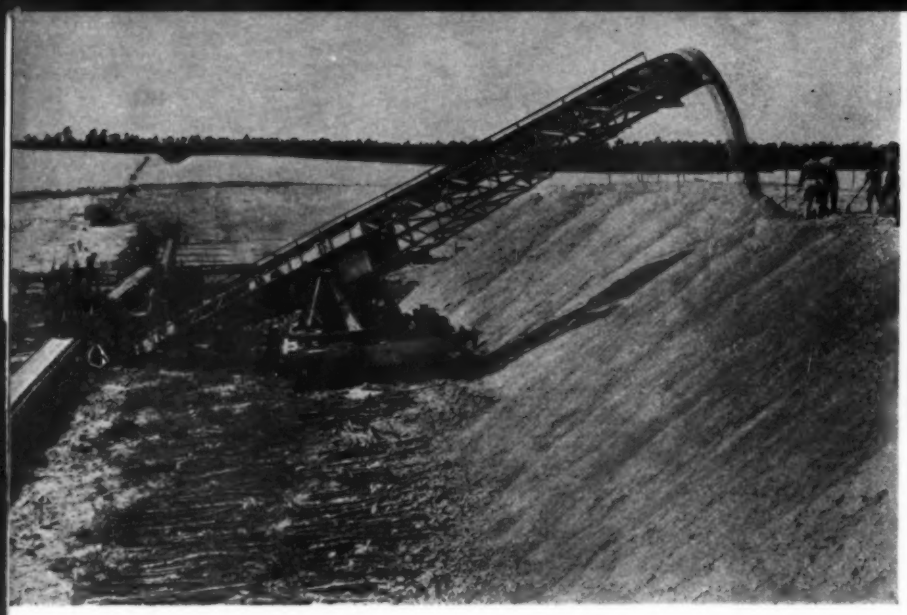
Case dismissed, court's adjourned. Let's all go out and have a look at this shovel that moves twice as much as I would have expected. However, the witness has been under oath and has shown us official records which cannot be disputed.

Addenda

Not included in the court proceedings are several facts concerning this Santa Rosa Municipal Airport job. At the airport several men are employed in spreading the material dumped by the trucks. Finished grade is being obtained by use of a Caterpillar "60" tractor hauling an Austin grader with 10 ft. blade. The volcanic ash, while too hard to be dug without shooting, disintegrates under pounding and forms a fine, compact floor for the airport.

The initial contract secured by Krusze, Crane & Cox calls for 20,000 cubic yards at 29½c. They are virtually assured of an additional 20,000 yards at the present time. They feel confident that the fast little shovel will be kept busy practically all the time during the entire 1936 season.

• Some idea of the fast swing on the Bucyrus-Erie shovel may be gained from this shot—snapped at full speed, the dipper just a blur as it travels past the lens. Beneath the dipper may be seen Harold von Krusze.



Belt C
Speeds C

• *Note here how the stacker can be kept in normal operating position irrespective of ground conditions negotiated by the "cats." The stacker piles the bank almost exactly to correct height and grade.*

ITEMS 6 and 7 of the Atlantic-Gulf Ship Canal, involving about 1,200,000 yards, were let to the Badgett Construction Company of Memphis, Tennessee. Item 6 included about 651,000 yards, and item 7, 542,000. The two are contiguous and are located near Ocala, Florida. Typical cut was 27 feet; height of the spoil banks was about 21 feet.

In order to move the excavated material without re-handling, Badgett Construction Co. decided to use a Jeffrey belt conveyor which would be fed by a Bucyrus-Erie 43-B, 2½ yard dragline. This equipment was purchased new for the job, and worked so successfully that the contract was completed three weeks ahead of schedule.

The equipment layout was projected on an 80% efficiency basis and to allow for interruptions and delays, the units were designed to handle at an hourly rate of 450 yards. The job was scheduled to operate six days a week on a 24-hour working day basis, of which something like 20 hours were effective for actual excavating, the remaining hours being taken up by moving, etc.

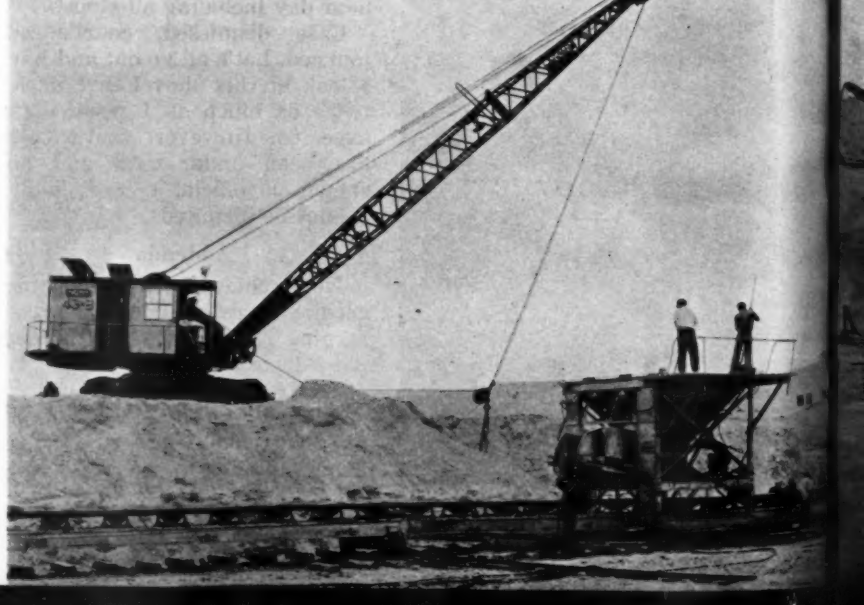
A Handy Use for Hand Labor

Use of a belt conveyor system also provided an excellent opportunity to use the 1500 man hours of relief labor required by the government for each $1,000 of the contract. This large amount of labor caused the contractors all along the canal no little puzzlement in selecting equipment and methods which would work economically and yet employ a large number of men. Badgett Construction Company used the labor hand shoveling onto the belt along the entire length. It is no small tribute to the conveyor system that, despite the fact it was heavily penalized by the employment of so many hand shovelers, it did the job economically.

The projected stretches of artificial waterways are for the most part through rolling country and the Canal was planned for a bottom width of 250 feet and a depth of 30 to 33 feet below mean sea level. Surface material was largely sand or sandy soil which at its maximum attained a depth of about 50 feet and was underlaid by soft rock formation.

The government specifications set forth that the material excavated must be wasted alongside and equally divided between the two banks of the Canal, and that spoil banks must be of constant height. To comply with this limitation it was necessary to vary the width of the spoil banks according to the depth of excavation at any point of the belt conveyor.

The story of how Badge... met problems on At...



• *A close-up of the dragline and loading hopper. The Bucyrus-Erie dragline has a 50-ft. boom and a 2½ yard bucket. It makes three passes a minute consistently.*

Conveyor Canal Work

• *Steel conveyor supports are made up of hinged short sections and provided with adjustments that keep the belt level transversely and permit the conveyors to conform longitudinally to irregular ground contours.*

onstruction Company tic Gulf Ship Canal

Final Grades With a Minimum of Finishing

The belt conveyor system extended entirely across the width of the Canal and the stacker moved on and along the bank as shown in one of the accompanying illustrations. An important feature of the stacker was the fact that it disposed of excavated material from the main conveyor line just about in its final position on the spoil bank and thus gave finished grades and slopes with a minimum of leveling. This was made possible by the fact that the stacker could be kept positioned at a convenient angle to the main line belts.

In operation the equipment took one-half the depth of the Canal in a first cut, placing the material on one bank in a march down the entire length of the Canal section covered by the contract item. Then on the return it completed the excavation to full depth, with the stacker on the opposite end to spoil the excavated material on the other bank. Furthermore, the plan was to so adjust the taking of material as to have it represent approximately one-half of cross-sectional area during each step of the advance. By placing the conveying equipment in the bottom of the cut close to the face and by loading through a portable hopper and feeder, motions of the dragline were kept to the minimum. In lift they seldom exceeded the depth of the cut and in swing were rarely more than 60 degrees. The Bucyrus-Erie 43-B was equipped with a 2½ yard Red-Arch bucket on a 50-foot boom, and was powered with a Caterpillar Diesel engine. It took a cut 30 to 35 feet wide straight across the Canal, moving up a few feet at a time.

Conveyor Constructed for Flexibility and Mobility

The main belt line, which was 36 in. wide and operated at a speed of 370 feet per minute, was 900 feet long and divided into two units. The steel supports for this conveyor were made in short spans hinged together and supported on double flanged wheels which moved on tracks running laterally, or in a direction parallel to the center line of the Canal. These mountings were made adjustable so that the belt could be kept in a level position transversely while the supporting wheels followed the contours of the ground. Their adjustability compensated also for longitudinal shortening and lengthening of the conveyor to conform to irregular ground contours. These features are shown in the photographs.

(Continued on page 512)

• *Over-all view showing conveyors at the bottom of the cut and stacker at the far end building the spoil bank. With the top of the loading hopper about level with the top of the cut, the lift of the dragline bucket is held to a minimum.*

EQUIPMENT
You Ought to Know About

Tandem Drive Speed Patrols Announced

ANNOUNCEMENT has been made of the addition of tandem drive speed patrols to the line of Allis-Chalmers road machines. The new patrols come in two sizes, one having 42 horsepower and the other 54 horsepower.

Constructed along the trend of modern automotive design the new A-C tandem patrols have many new and outstanding features such as wide front axle for greater stability—wear take-up provision at all vital points—ball and socket connections—and hydraulic brakes of the internal expanding type. A complete range of tire equipment is available including both low and high pressure types in 4 or 8 wheel tandem assemblies to meet a wide variety of working conditions.

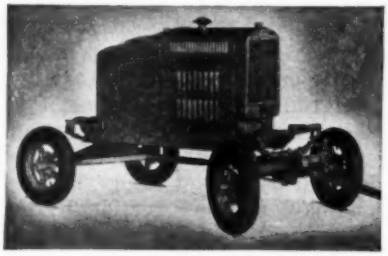
The model 42 weighs 15,350 pounds and the model 54 weighs 17,130 pounds. Speeds range from 2.3 to 10 miles per hour. An extra long blade base allows for maximum effective blade pressure and a huge circle, 5-foot, 4-inches in diameter, provides for rigid moldboard mounting and "chatter-proof" performance.

A gear drive enclosed in an all-welded case transmits power from the drive shaft to the final drive axles. After exhaustive tests Allis-Chalmers found a gear drive to be the most satisfactory because it eliminates troubles such as noise, stretch, rapid wear and the need for constant adjustment which are encountered where chain drives are used. In writing to the manufacturer for further information, please mention Excavating Engineer.

Engine-Driven Arc Welder

A PORTABLE engine-driven arc welding machine, which, it is claimed, is of particular interest to the highway field, is announced by J. D. Adams Company of Indianapolis.

Since the widespread adoption of the electric welding process in the fabrication of road machinery, many highway departments and contractors have become interested in this process, for the repair of all kinds oif machinery, bridges, etc., and for the building up of special structure and equipment to be found around almost every highway garage and yard.



The Adams Arc Welder is mounted on steel skids in which form it occupies very little space in the shop during the winter "machinery overhauling" season. When required for field use the machine can either be hoisted into a truck or mounted on a steel trailer with rubber tires as illustrated.

An exclusive feature of the Adams Arc Welder is a remote control switch in the electrode holder which enables the operator to start and stop the engine at will though his machine may be located several hundred feet from where the operator is working. This eliminates waste of fuel and destructive engine idling between welds.

Complete information on this welding machine may be had by addressing J. D. Adams Company, Welding Division, Indianapolis, Indiana.

New Street Series Lamp

REVOLUTIONARY changes in the design of its 4000 lumen, 6.6 ampere, street series lamp namely, a horizontal filament, a tubular bulb, and a bi-post base, promise more accurate control of street and highway lighting so desirable in the trend of greater traffic safety through the medium of higher levels of illumination, according to an announcement by the Westinghouse Lamp Company, Bloomfield, N. J.

An outstanding feature of the new lamp is its filament design. The horizontal filament reduces the vertical height of the light source making possible improved vertical light control by accessory equipment which in turn permits reduction of glare.

The medium bi-post base incorporates prefocusing characteristics assuring accurate light center length and correct axial alignment and facing of the filament. These features contribute to accurate light control in street lighting fixtures.

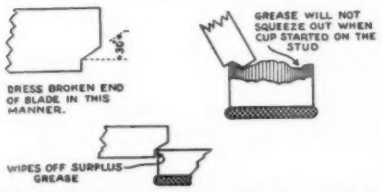
Designed in a T-20 clear bulb, the new lamp is for base-up burning only. The pyrex bulb eliminates the need for expensive water-proof fixtures.

Field Notes

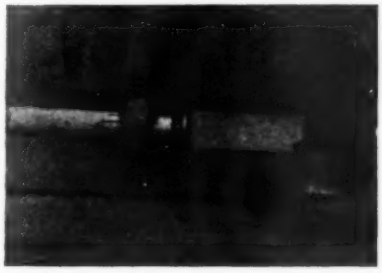
Old Case or Table Knife Made Into Handy Paddle for Filling Grease Caps

A SMALL wooden paddle is the usual device used in putting grease into cups or caps when they are empty, but the most neatly whittled of paddles is none too handy.

Take an old case of table knife, cut it off about in the center, and grind or file the end as shown.


DRESS BROKEN END OF BLADE IN THIS MANNER.
GREASE WILL NOT SQUEEZE OUT WHEN CUP STARTED ON THE STUD
WIPES OFF SURPLUS GREASE

The portion at an angle is turned around the inside top of the cup and tapers the grease off near the threads. When the cap is put on and turned, grease will not squeeze out as it usually does



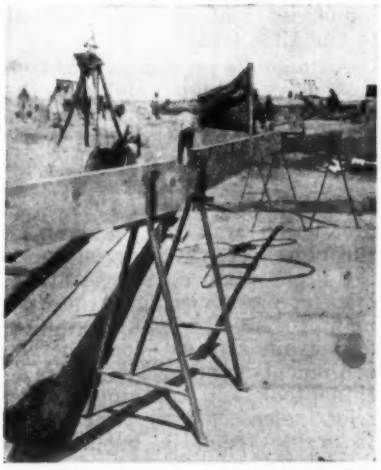
when the cup is filled straight across. Any grease left on the outside of the cup can be readily removed by running the end of the paddle around the outside held at right angles as shown in the photograph.

Little wiping is necessary when cups are filled with this easily made little paddle.

—Frank Bentley, Jr.

Light Supports for Barriers

BARRIER supports which are easy to haul from job to job and can be erected or taken down in a moment are made by welding in a 12 inch section of 2½ by 1 inch channel, horizontally, between two legs of lighter channel about 36 inches long. The leg channels are bent parallel above the horizontal member, so that a 2 in. plank may be laid edgewise between them, as shown. With a



support near each end the barrier plank is held firmly in place. The legs are cross braced some distance from the ground and short feet turned on the bottom end.

Cooling Small Contractors' Buildings in Summer

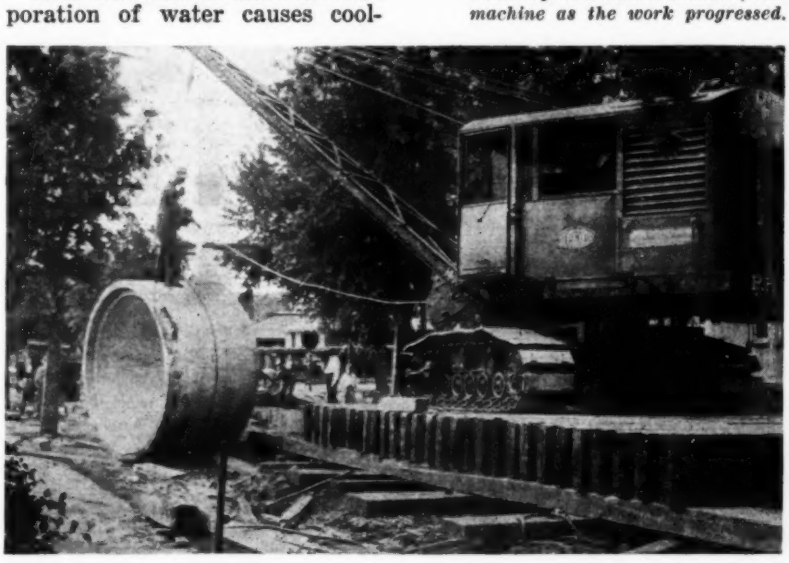
IT IS common practice for engineers and contractors to erect small wooden buildings while on jobs which, in the summer time, are "hot as blazes."

Now that air conditioning is becoming so common and popular it might be well to point out that these small buildings can be kept comfortably cool in much of the hottest weather, at small cost, by applying simple scientific principles.

It is well known that the evaporation of water causes coolness, or "extracts heat." That is why one feels cool when one's perspiration evaporates. In fact, evaporation of perspiration actually does keep the body cool. Therefore, to keep a building cool "make the building perspire." This is done by running a few water pipes along the ridge of the roof and under the eaves—pipes with rows of holes drilled in them to permit wetting of the roof and sides of the building by sprinkling. As soon as the surface of the building is wet, turn off the water. The amount of water required is not great. The evaporation of the water will then cool the building. An automatic device for wetting the outside of the building every half hour or hour, depending upon the rate of evaporation, can be installed if desired.

The results, of course, will not compare with the results of high grade manufactured air conditioning apparatus, especially in humid weather. But when humidity is low this method is far superior to no cooling system at all.

—W. F. Schaphorst, M.E.



● *A safe footing for this dragline, used by Lawrence Construction Company to backfill, as well as place concrete pipe, on a Denver sewer job, was secured by a corduroy construction of heavy planks, placed edgewise on top of stringers, with short blocks between the planks near the ends. Planking was moved ahead of the machine as the work progressed.*

EXCAVATING ENGINEER

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F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

D. B. REED, JR.
Assistant Editor

A. R. TOFTE
Assistant Editor

E. M. HEUSTON
Advertising Manager

The Business Situation

THE increase in momentum of business recovery during the first six months of 1936 has contained healthy features which seem to make each gain a sound base from which to take a further upward step. Business improvement has maintained a balance, exceedingly important, and favorable to continued progress.

In normal times employment in durable goods industries has ranged between 50 and 55 per cent of total industrial employment. At the lowest point of employment, which occured in 1933, the number of those employed in production of durable goods had fallen to less than 40 per cent of total industrial employment. By May, 1936, the percentage had risen to 49, a rise especially significant in view of the fact that employment in consumers' goods industries had increased almost to the 1928 level.

Automobile production has continued at a high rate into the time when there is usually a drop in anticipation of the next year's models. Today more automobiles are in service than there were in the prosperous days of 1929. Steel production was maintained through June, with current rates the highest since 1930. Automobiles have provided the largest demand for steel, but increasing orders from railroad, construction, equipment-manufacturing, machine tool, and container industries indicate a very general and favorable trend in business recovery.

Agricultural income has increased, despite reduced payments by the government, and demand for agricultural products continues good. Cotton is in the strongest position of many years, with other textiles also having a favorable outlook. Railway freight movements continue to increase, consumption of electricity in June reached its highest peak. Retail and wholesale sales have continued up, with bonus spending less of a feature than was expected.

Contracts awarded in the construction industry during the first half of 1936 were over 75 per cent larger than the corresponding months last year. While the gains in this field have not been as large as was hoped, the increase of privately financed construction has been extremely encouraging. Where 43 per cent of contract awards were privately financed in 1932, the second quarter of 1936 saw 54 per cent privately financed. Total residential building for June, in the 37 states reported on by F. W. Dodge, at $73,604,600, was 5 per cent above May, and 48 per cent above last June.

Discouraging elements in the present situation are the tax situation and political uncertainty, drought and threatened labor trouble in the steel industry. However, business sentiment has been more strongly influenced by the favorable than the unfavorable elements in the present setup.

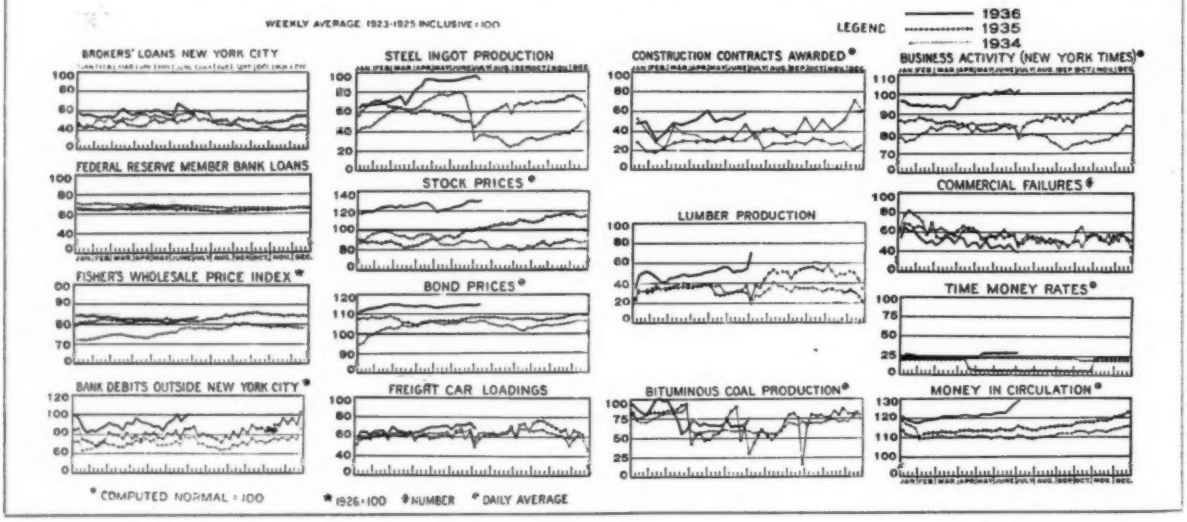
While indexes are still below normal in most lines, and the upswing is still lubricated by government spending, progress during the first half of 1936 was encouraging in itself and in the promise held out for the future.

Foresight

THOUGHT-PROVOKING is the contrast between 100,000,000 acres of seared farm land and 3,000,000 acres, in the same drought-blistered region, but green and growing because of the water supplied by Federal Reclamation works.

The enormous area despoiled by droughts and floods in 1936 alone, as well as the almost un-estimatable damage, cries the necessity of a preventive system on a truly

WEEKLY BUSINESS INDICATORS



Herculean scale. Spotty local efforts to safeguard against rampant nature are as futile as King Canute's command to the waves to come no farther.

Those irrigated western farms whose 1936 crops will be normal stand as an example of what can be done, and as a beacon illuminating what must be done. Critics have decried a policy of reclaiming land for agriculture when existing land has produced such a superabundance that we must plow under every other everything. But who is going to eat the bread made from the wheat grown on those 100,000,000 acres? And who, now, is eating pork "plowed under" by the A.A.A.? Any planned economy is a joke as long as there is no way to keep droughts and floods from tossing a monkey wrench in the machinery.

Recurring droughts may well make it necessary to move the entire farm population from large areas of the arid states onto land where a fair return for work can be reasonably assured. What better place than irrigated farms made possible by a fore-sighted policy of reclamation?

So enormous is the work to be done in handcuffing nature that a single generation can only see the beginning. But step by step that work must be done. A splendid start has been made and additional projects are now being developed by the Bureau of Reclamation, and the U. S. Army Engineers. The important thing to remember is the long range picture and the vital necessity for wise planning and skillful execution. Work of this nature cannot be left to be started in the day of need. Plans must be made and projects started long before the actual necessity is upon us.

Only by keeping ever in sight a complete plan, into which will fit the units we construct now, can we get ahead of schedule on the contract nature is so grimly forcing on us.

J. J. Stephenson

AFFECTIONATELY known to countless friends and coworkers in the open-pit coal mining industry as "Uncle Joe," John Joseph Stephenson, 77 years old, died at his home near Pittsburg, Kansas, on June 18. His health had been declining for two years, and his condition became critical about a month before his death, due to cerebral hemorrhage.

Born in England in 1859, he came to this country as a lad of 14 with his parents. He first went to Texas, where he entered the contracting business in 1881. The majority of his work was with railroads, and his contracts with them resulted in his gradually moving into Kansas and Missouri.

It was in the former state, in 1889, that he began operating in the strip coal mining industry. Horse and mule teams were then used in stripping, but he was one of the pioneers in installing power shovels in the field.

A number of companies now prominent in the Pittsburg district were developed by him. Among them are: the J. J. Stephenson Coal & Mining Company; the Pittsburg-Scammon Coal Company; the Litchfield Coal Company; the Superior Coal & Mining Company; the Stephenson-Fenimore Coal Company; and the Weir-Cherokee Coal Company.

In 1928 he began a process of gradual retirement, turning over the active management of his many affairs to others, but retaining his contacts and giving valued advice to friends about the business he knew so well.

He was married twice: to Miss Ann Causic in 1887; and to Miss Myrtle Carter in 1913. He is survived by the second Mrs. Stephenson, by one daughter, two sons, five grandchildren, three great-grandchildren, two sisters, and a brother.

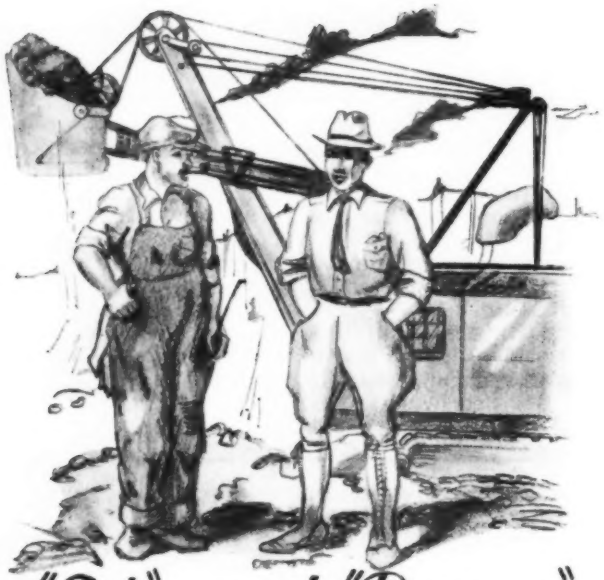
Because of his long service to the industry, Stephenson was often referred to as "the Dean of Coal Men." Certainly, his remarkable integrity, completely straight-forward character, and deserved success more than entitled him to the dignity of that title, but the warmth of personal affection which he drew to himself throughout his grand lifetime will make him "Uncle Joe" in memory, as he was in life.

F. W. Roebling, Jr.

THE announcement of the sudden death of Ferdinand W. Roebling, Jr., President of John A. Roebling's Sons Company of Trenton, N. J., in his 58th year, came as a profound shock to the hundreds of persons who admired him for his sterling qualities of character and were proud to call him friend. Mr. Roebling's death occurred at the New York Medical Center in New York City, of complications following a major operation. He was the youngest son of the late Mr. and Mrs. Ferdinand W. Roebling, Sr., and a grandson of John A. Roebling, founder of the Roebling family and of the famous engineering firm.

Mr. Roebling was born in Trenton, September 29, 1878. After graduating from the Model School in Trenton, he became a student

(Continued on page 412)



"Ed" and "Pansy"

Ed Waves the Flag of Truce and the Foreman Makes a Hole in One . . . Something of a Fish Story

By **LE ROY BERGFELD**

Illustrated by M. C. Johnson

THE QUARRY Foreman bitterly cursed the world in general and shovel "skinners" in particular as he washed great smears and gobs of gear shield from his arms and neck in the mechanic's wash bucket.

It had been scorching hot in the quarry; sweat poured from his arms and forehead as he cursed.

The blacksmith, standing by, remarked: "How come you're so hot and covered with grease? Thought the boss didn't have to work."

"Working," the Foreman's voice oozed venom, "would be a vacation for me. Some day I'm gonna have you make a cage for that damn Ed Evans. I'm gonna lock him up and get a job on the section for two weeks."

He carefully dried the gasoline from his arms and neck and thoughtfully filled his pipe. Continuing, he said: "Ed dug the canal you know; he may have been a 'hot foot' in a dirt job, but the canal has been finished for twenty-five years and he's still digging it. I can't teach him the difference between loading dirt and rock. He hits the pile wide open every time. If a boulder happens to be covered up in the pile he locates it by breaking the chain, and then carefully digs it out after he loses an hour splicing the chain."

The Foreman had cooled off somewhat, and much of the bitterness had left his speech; usually he cursed and yelled and threatened hell fire, destruction, death, or discharge on similar occasions, but quickly returned to normal and laughed at the incident. His wrath, at this instant was materialized by Evans breaking a hoist chain hitting an invisible boulder in the pile. The Foreman had helped to splice it. The intense heat had reduced the heavy plastic gear shield with which the chain was greased to a very fluid substance, which dripped freely from both the chain and boom, thus the Foreman acquired the coating of grease, and lost his temper.

Actually, Ed helped to dig the "canal." He was a good operator but of the old school of steam machines, and possessing all the characteristics of the class. He was stubborn and mean. His machine was so coated with grease, soot, and coal dust that it was impossible to be near it without becoming similarly grimy. In direct contrast was the other excavating unit, just installed, an electric "whirley," which at the Foreman's personal direction, had been kept spotlessly clean. The operator, too, had been able to wear clean clothes as compared to Ed's grease-soaked overalls.

What's in a Name?

This added again to Ed's perpetual denouncement of "whirleys" and those who operated them. In derision he had coined the word "Pansy" as meaning the new operator and determined to "show him up for a kid with a play-purty" in producing tonnage.

As a consequence Ed laid caution and good judgment aside, losing tonnage, and thereby earning the enmity of the foreman.

The incident of the foreman's wrath quickly passed into quarry history and was forgotten. Production moved back into step—all seemed well. Then the dinkey was slow returning with empties and Ed, not being content to rest a few moments, grabbed an oil can and proceeded to pour oil into every imaginable place his brain could conceive as needing oil. After looking up the track and noting the dinkey still "on spot," he removed the pit cock from the ram head and poured a bounteous supply of valve oil into the

ram. Slim Hawks, Ed's craneman, watched without comment.

"That'll make her release quicker, Slim," he said. "I always like the clutch to release quick and not drag." Ed threw the "ram in," with the lever standing directly under the throttle, saying: "I'll keep her full of steam and that will spread the oil good." He glanced up the track at the dinkey. "Believe I'll walk up and see what's wrong."

Soon after his departure, "Pansy" also being on "the Spot" came over to visit with Slim, who, unlike Ed, was an amiable fellow, and had quickly made friends with Pansy. Pansy climbed upon the operator's seat and he and Slim proceeded to talk.

Fishing Was a Fetish

Ed had progressed as far as the foreman's shack, where he found the latter busily engaged in rigging a new trot-line. Fishing was a fetish with the Foreman; the rigging of tackle was a ritual, as religiously and superstitiously followed as the rites of Paganism. His line had been tarred, hooks tied, and he had mortised and varnished a white pine board secured from the lid of a powder box, preparatory to wrapping his line around. The board, he had laid beside him, one end resting upon a flat stone.

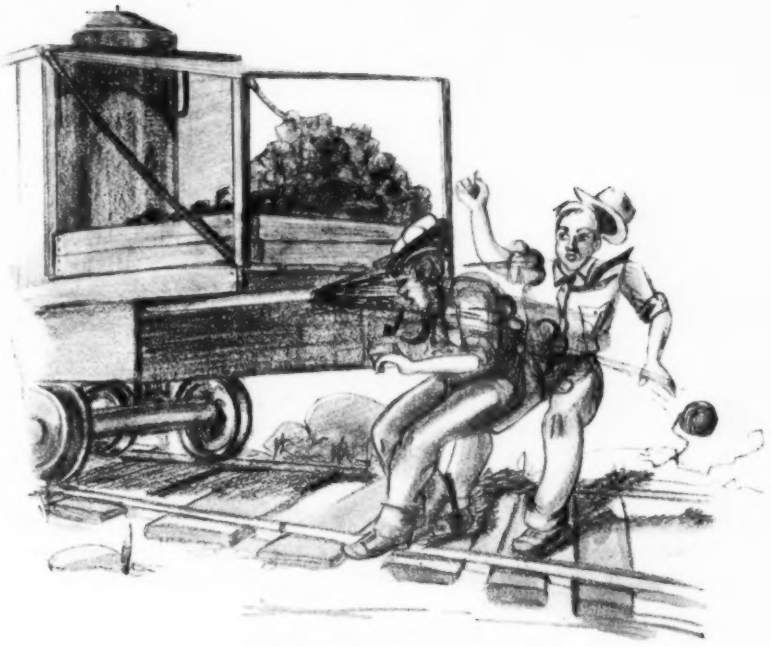
Ed came around the shack and inquired:

"What's wrong; no empties?"

"Power's off for a few minutes. Ain't you got no repairin' to do," replied the Foreman.

"Look out where you're goin'," he yelled, but too late. Ed made another step, failing to note the reason for the Foreman's warning, and stepped squarely upon the varnished tackle board. The brittle white pine snapped into splinters. Ed jumped as if shot. The Foreman laid his line down with slow deliberation, and as deliberately arose.

"Get back on that shovel, you blind, blundering, idiot," he screamed. Then, as Ed turned to leave, "Hey, since you've busted my board hold one end while I roll this line up; and after this don't ever get off your shovel for anything."



The exhaust spat like a rifle . . .

They proceeded to wrap the line into a ball; the foreman's anger disappearing proportionately as the line was wound, and vanishing entirely as the last round was laid to make a perfectly rounded six-inch sphere.

The siren in the crusher building moaned tremulously three times, a signal from the power house operators that they were now ready to carry the quarry load. Ed started walking down the track toward his shovel; the Foreman accompanied him, the ball of trot-line under his arm.

Comments on Clothes

As they neared the shovel, Ed remarked: "You know, I kinda like that feller 'Pansy.' If he just . . . " The Foreman grunted in amazement.

Ed continued, "If he'd just take off them yellow pants 'n wear overalls 'n get some grease on 'em he'd be a purty good feller."

They had reached the shovel and stopped along side of it. Ed stood slightly ahead of the Foreman, directly opposite the extended ram exhaust pipe which Ed had rigged up, to carry exhaust steam from the ram to a point where it would not come up through the operator's platform and add to the natural scorching heat of the quarry.

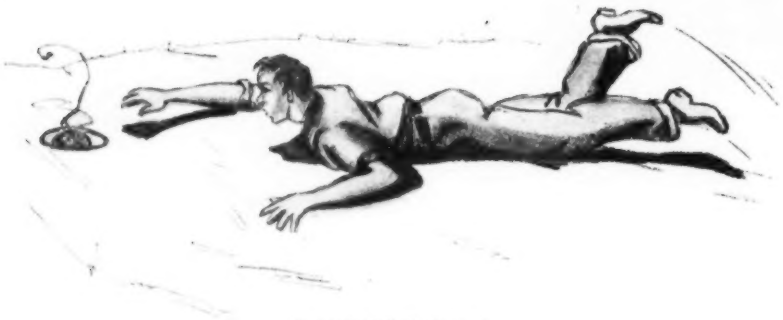
"Now, me," he said, "I feel more natural with a lot of grease on my clothes; grease and dirt don't hurt anybody and makes 'em look like a working man, not a gigolo."

Slim, who had been sitting backwards in his seat while talking to Pansy, observed the approach of Ed and the foreman. Wishing to avoid an embarrassing scene he remarked as to their presence; Pansy arose from Ed's seat to go. For some instinctive reason he reached out for the valve lever and "cut the ram."

The results were immediate and decisive. The exhaust spat like a rifle and fully a half-pint of warm oil, with generous quantities of hot water and steam, hit Ed squarely in the face.

. . . The One That Got Away!

"Help!" he screamed. "I'm scalded!" as he staggered backwards into the Foreman, knocking him down. "Get an ambulance! Call a doctor! Help! Help!" In the collision the Foreman lost the grip on his ball of fishing tackle. The slightly inclined quarry floor maintained its momentum as it rolled slowly toward the precipice of the second level. The Foreman ran to recover his trot-line. It struck a small stone and veered sharply toward an eight-inch



A perfect hole in one

blast hole. The Foreman attempting to increase his speed in order to intercept it, slipped upon a round stone and fell flat, just close enough to the hole to touch the ball, as it teetered on the edge, and supply the force necessary to send it plummeting down the 70-foot hole; *a perfect hole in one.*

For a second or two he lay still; then, as he arose slowly, grim determination came to his face and the lust for murder came into his eyes. Grabbing the broken pick handle he shouted at Ed, who, while cussing and howling with all his might, was wiping grease from his eyes and jumping around like a "whirling Dervish."

"You damned old she goat, you bust my tackle board, then you knock me down and make my new line roll in a well hole—I'm gonna wrap this pick handle around your neck and . . . "

Unnoticed, the Super had come into the quarry and witnessed the whole scene.

The Voice of Authority

"Just a minute, you two," he said very sternly. "I can use all that activity very nicely applied to production." "You," he said to the Foreman, "throw that pick handle down before I use it on both of you. And you, Ed, get on that shovel and use some of your excess energy loading rock."

"My trot-line," began the Foreman. . . . The Skipper interrupted. "There's a line of dinkeys up there that need your attention right now. Unravel *that* line."

Ed interrupted: "That damn Pansy scalded me."

"I know," the Super said. "You've been told a hundred times to take that damn extension pipe off. You got a big kick out of blowing steam and water on the pit hands and trainmen, but you can't take it yourself. I'm changing my orders now; leave that pipe on, and if I ever hear of you blowing steam on anyone else I'll take it off and break it across that damn ivory dome of yours."

The Super hastily returned to his car. The sternness left his face; tears of pure joy coursed down his cheeks. He remarked to himself: "That's one time the devil got boiled in oil—I never thought I would live to enjoy it. I wouldn't have missed that circus for a brand new hoist chain and a pair of swing ropes thrown in free."

Conveyor Speeds Canal Work

(Continued from page 405)

The stacker boom was on 100 ft. centers and a slope of about 17 degrees. A caterpillar supported it centrally and consisted of two trucks independently driven by electric motors. The suspension of the boom over the mounting freely permitted angular movement of the boom in its longitudinal plane.

Transverse leveling of the belt was accomplished by a separate electric motor which operated a traveling nut device to allow immediate adjustment irrespective of ground irregularities. The boom was swung on a turntable with a special motor drive. With these control features at his command, the stacker operator was enabled to keep the loading point in satisfactory relationship to the tripper discharge of the belt irrespective of the horizontal angle which the stacker occupied with respect to the belt line. Remote control pushbuttons enabled the operator to start and stop any or all drive motors. The electrical system, of course, was provided for sequence starting of the conveyor system.

360 Yards Per Hour With 2½-Yard Bucket

Of importance to the excavating contractor is the fact that the belt system enabled the dragline to make three passes per minute regularly, equivalent to something like 360 yards per hour or 7,200 yards per day. This output plus that furnished by hand labor brought the daily production up to 8,000 or 9,000 yards a day. In the first four months of operation the belts handled about 650,000 yards.

As did the conveyor system at Grand Coulee, that on this Florida job proved conclusively that conveying equipment works hand in hand with power shovels, draglines, etc., to the common end of reducing production costs of the entire operation.

F. W. Roebling, Jr.

(Continued from page 409)

in the Adirondack-Florida School, where he prepared for Lehigh University. Following the tradition of the family he took the engineering course and was graduated a mechanical engineer in 1901. He immediately entered the employ of the Roebling Company in the Engineering Department, under the direction of his uncle, Charles G. Roebling.

While in this department he drew plans for the Williamsburg Bridge and for other large structures erected by that company. He also designed patterns for new machinery for wire drawing, which are still in use in the plant.

He occupied successively the official positions of Assistant Treasurer of the Roebling Company in 1914, and Secretary and Treasurer in 1917, upon the death of his father, Ferdinand W. Roebling, Sr. After the death of his brother, Karl G. Roebling, he was elected Vice President of the Company and also retained the office of Treasurer. He became President in 1926, succeeding his uncle, Colonel Washington A. Roebling, who died that year.

Mr. Roebling was married in 1905 to Miss Ruth Metcalf who, with two sons, Joseph Metcalf and Ferdinand W., III, survives him.

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Goodyear has a special "high shoulder," high performance truck tire for you. It is the Dump Truck All-Weather—a tire that will give you longer, better, more dependable service at a tremendous saving in your tire costs.

It is big, sturdy, tough—with extra cushioning, extra strength for swaying loads and overloads, extra grip, pull and nonskid both off the road or on, extra protection against cuts and bruises.

These special features make this plus performance possible: Sure-footed traction of that famous All-Weather tread; Special chemically toughened rubber in both tread and body; Heavy, tough sidewall bars for traction in ruts and protection against sharp rocks; Supertwist Cord body for greater body strength; Extra strong bead construction.

This special Dump Truck All-Weather was specially built for the work your trucks do. It gives you more miles per tire—more tire per dollar. Look into it. It will save you money.

THE GOODYEAR TIRE & RUBBER COMPANY, INC., AKRON, O.

***HIGH SHOULDERS**

"High shoulders" refer to the greater sidewall area between rim flange and edge of tread design. This increased flexing zone provides greater cushioning, makes tire less susceptible to cuts and bruises. It distributes road shocks and heat over a wider area—dissipates heat more readily. Thus it protects against both carcass failure and tread wear—lengthens tire life by thousands of miles.

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

For your convenience in writing to The Goodyear Tire & Rubber Co., you will find a card bound in this issue.

Control MAKES THE DIFFERENCE

SPONTANEOUS COMBUSTION VS. CONTROLLED IGNITION

A pile of greasy wipe rags in the corner. Heat generates . . . and sooner or later . . . pfoof! . . . building and equipment go up in flames. Spontaneous combustion is *uncontrolled* . . . and is the direct opposite of Controlled Ignition.

CONTROL *means* ECONOMY

Controlled Ignition MEANS LOWER FIRST COST .. LESS DEAD WEIGHT... LOWER OPERATING COSTS

A WASHINGTON owner found that an Allis-Chalmers Model "L-O" Oil Tractor saved 77% on fuel costs . . . compared to a 60 H. P. gasoline tractor . . . and did far more work. ● It is only logical that the A-C Controlled Ignition principle should assure maximum economy. Diesel fuel oil is ignited with a spark at a point which is *controlled* for greatest efficiency. Dead weight is reduced . . . through elimination of special, heavy construction. No extra weight and upkeep of an auxiliary starting motor. No need to waste fuel keeping the engine running while tractor is idle—because Controlled Ignition tractors start *instantly*. Be a step ahead! Investigate before you buy! Ask an A-C dealer for the facts!

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Easy starting, regardless of weather. Crank or self-starter. No auxiliary starting motor.

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Specially designed injection system maintains proper ratio for efficient combustion at ALL engine speeds. No excess of air at idle speeds to lower exhaust temperatures at the expense of power.

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Controlled spark ignition at exactly the proper point for complete efficient combustion. No chance of power-wasting pre-ignition. High compression pressures with the resulting destructive forces are eliminated. No need of special rings, special high-pressure bearings, special lubricating oil or heat reservoirs in the combustion chamber.

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ILLIS-CHALMERS *Controlled Ignition* **OIL TRACTORS**
TRACTOR DIVISION—MILWAUKEE, U. S. A.

SHOTS from the Firing Line

New Records at Fort Peck

AT THE Fort Peck Dam the four giant electric dredges of the Army Engineers pumped the phenomenal average of 8788 cubic yards per hour for every hour of the four day period ending 8:00 A. M., Monday, July 13th. This is an average of 2197 cubic yards per hour for each dredge.

In the period of June 16-30th, 1936, the largest total yardage was recorded of any half-month since the start of operations at Fort Peck. Fill measurements June 30th showed 1,935,900 cubic yards deposited. However, the first half of July probably saw a greater amount than this added. On July 1st, Dredge Jefferson reported the highest single day's performance of any dredge to date, namely, 67,150 cubic yards in 24 hours. July 3rd was the biggest day's total for all four dredges to date when 188,890 cubic yards were pumped.

On the downstream slope of the west-bank portion of the dam the fill is now up to the first berm. These berms are level areas on the slopes of the dam and will be about 30 feet wide. There will be four of them at various elevations on each slope. The one just reached is elevation 2139 which is 44 feet above the level of the Missouri River bridge.

Dredge Jefferson, digging into a sand bar in the old river channel, has been pumping fill into the dike section so rapidly that the crews on the fill in the discharge area have been unable to take care of all of it. Accordingly, a portion of the discharge is being deflected onto the west-bank main dam section. The Jefferson pumped over 2400 cubic yards an hour during each of the days above mentioned.

While the dredging crews were establishing new construction records, the men in the tunnels were likewise making excavation history. July 10th and 11th saw a total of 224 lineal feet of progress at four bottom headings where enlargement operations are under way. This is the best 2-day record made so far at the tunnels. Thirty-five feet of advance was made in No. 3 on the 10th and the same amount in No. 4 on the 11th. Total footage run to 645.8, the record week to date. This is an average of 23-2/3 feet per heading per day.

Work of placing the concrete lining behind the excavation progressed at a satisfactory rate with 495 lineal feet of invert and an equal 495 feet of "barrel" poured during the week. This required 6817 cubic yards of concrete. Concrete poured in the shafts and at the upper portals raised this figure to 10,443 cubic yards, the highest weekly total to date.

Enlargement of all four tunnels has passed the shafts and is on the "home stretch" to the upper portals. No. 1, of course, will be the first to reach there, having only 486 feet remaining. In the meantime, steel plate lining and concrete work in the shafts is progressing rapidly. No. 1 emergency is above the ground surface and will soon be extended up to the level of the elevation of the top of the dam when it is completed.

Spillway construction is now proceeding at a more rapid rate than at any previous time this year. Workmen have been trained so that they understand the details of the work and are able to carry on with the minimum of lost motion. The Massman Construction Co. poured 82 slabs of the concrete floor of the channel during the week, using 9,203 cubic yards of concrete. This indicates that the slabs average a little over 100 cubic yards each.

A wide expanse of floor has been completed. The surface area is now about 475,000 square feet, or 11 acres, which is big enough for the arena of any western rodeo. It has taken 70,000 cubic yards of concrete for the floor so far and it is approximately half done. Three power shovels and a fleet of dump trucks are kept busy excavating ahead of the work on the floor slabs. They moved nearly 30,000 cubic yards of shale last week, dumping at the old spoil bank at the lower end of the spillway.

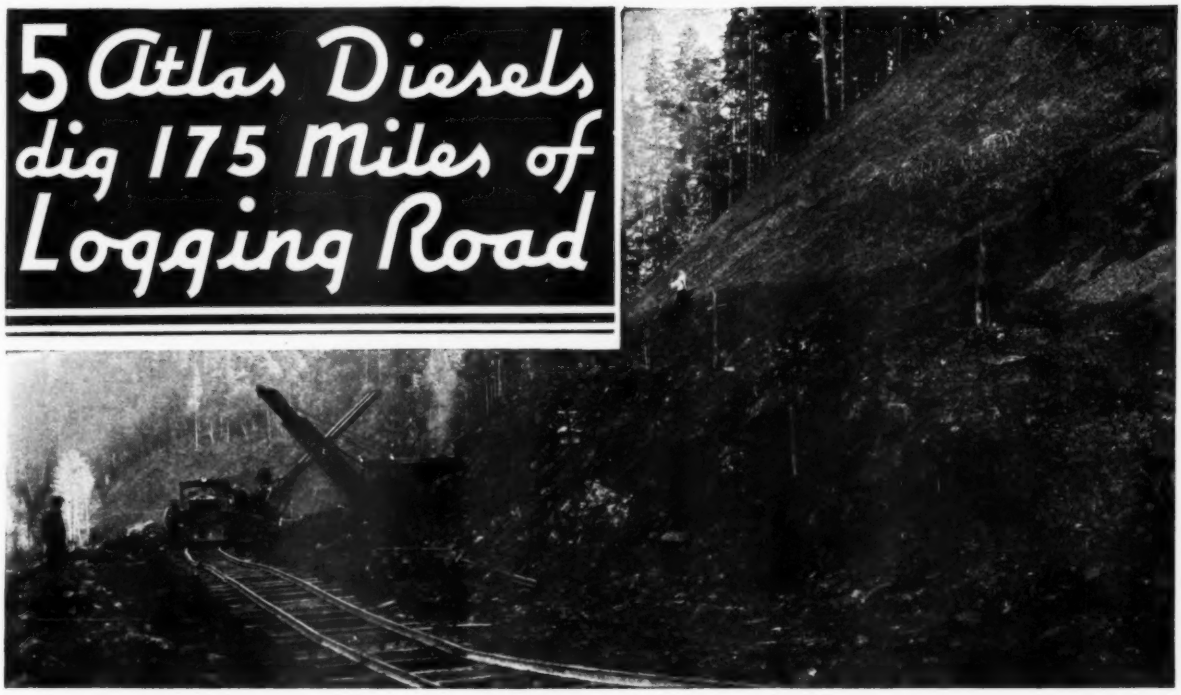
Work has started in earnest on the spillway channel sidewall lining. The sloping steel forms are ready and the trimming of the rock for the side slope is being done.

Addison-Miller, Inc., have completed 12 of the 15 training walls and another is partly constructed. The steel forms are ready for the first pour of a pier head. With the curved end of the form covered by bright aluminum paint, this set-up has a remarkable resemblance to the prow of a battleship.

Excavation is about complete for the

• *One sign of increasing prosperity has been the increase in small jobs all over the country. Here, Lane Construction Company's Bucyrus-Erie 10-B dragshovel is working on sewer construction near Hillsgrove, Rhode Island.*

5 Atlas Diesels dig 175 Miles of Logging Road



Out in the Pacific Northwest, extensions of logging railroads are continually being made in advance of the loggers so that when one stand of timber has been harvested, the logging railroad will have been built to haul to the mill the logs that a new stand will yield. Most of this construction is in mountainous areas where the going is mighty tough.

During the past eight years, five Atlas Diesel powered P. & H. Shovels have excavated 175 miles of such logging road for the largest lumbering operation and logging show in the Northwest. The first two shovels were bought in 1927, two more were put to work in 1928 and the fifth went into the woods in 1929. All have worked continuously, and about half the time on double shift.

All of their work has been hard construction, a great deal of it through solid rock—just the kind of work it takes to show what shovels are made of. Loggers, like building contractors, do not "baby" their equipment. It has to be able to "take it" if it is to stay in the woods.

The performance of these five Atlas Diesel powered shovels has been outstanding, their operating cost has been low and maintenance negligible. Besides these tangibles, Atlas Diesels do not emit flying sparks that start forest fires, nor do they present the water problem that is always incident to steam rigs. The trend in the woods is definitely toward Diesels and in power excavators you'll find more Atlas Diesels than the engines of all other Diesel manufacturers combined. Write for a copy of our catalog which covers the application of Diesel power to nine specific industries.

ATLAS IMPERIAL DIESEL ENGINE CO.

OAKLAND, CALIFORNIA ● MATTOON, ILLINOIS

ATLAS IMPERIAL

For your convenience in writing to Atlas Imperial Diesel Engine Co., you will find a card bound in this issue.

last training wall floor slab at the west end of the row. With the center training walls poured there remains one more on each end of the curve and the row is completed.

The warped surface of the sidewall lining ahead of the gates on the west side is being prepared. This is very difficult work and requires a considerable amount of hand labor. At the lower end of the spillway work has just started on the cut-off which is a part of the Addison-Miller contract. Tool sheds have been built and materials are being delivered to the site. Excavation of the deep trenches required for this piece of work will be started as soon as the bracing is ready to be put in.

Cliff Excavation

By C. W. Geiger

FOR many years the rock from the 200 foot high cliff overlooking the Cliff House and Cliff House highway in San Francisco, has been slipping and falling down onto the highway (principally during the winter rains). In an effort to stop this, work has been carried on for the past few years by the Park Commission, which when completed will forever stop this rock from sliding down onto the highway. The soft sections of the rock on the 200-foot face were excavated, this being done by hand on account of the almost vertical cliff. After the soft part was removed, the entire surface of the cliff was covered with cement and rock to a depth of from 4 to 6 feet. This not only acts as a prop in helping to hold the rock in place, but entirely shuts out the air, fog and water, the elements which cause the rock to become soft and fall off. The surface of this cement and rock covering is painted a volcano color and trees, shrubs and flowers are planted over the entire surface of the cliff covering in order to beautify it.

● *Working on the summit of South Mountain, this Bucyrus-Erie 43-B is relocating an old road during construction of the new highway between Frederick and Hagerstown, Maryland. The 43-B is loading an Athey "Forged-Trak" wagon pulled by a Caterpillar Diesel RD-8.*

In special pockets built into the surface of the cliff, are placed rich earth where cypress and olive trees, lilies and numerous other flowers and shrubs are planted.

The work is carried on by an elaborate system of scaffolding extending from the highway to the top of the cliff. On this scaffolding which extends almost straight up, the workmen stand and loosen and remove the rock from the face of the cliff and then apply the cement and rock.

Texas Project Changes Hands

Announcement has been made by the Department of the Interior of the transfer from the Bureau of Reclamation to the Lower Colorado River Authority, of supervision of construction, including all plans, drawings and specifications connected with Dams Nos. 1 and 2 of the Colorado River of Texas Project. Under a revised contract between the government and the Colorado River Authority, these dams will be constructed by the Authority instead of by the Bureau of Reclamation.

Work had already been started by the Bureau, with government forces, on construction of Dam No. 1 (Hamilton Dam). Three contracts made by the Bureau in connection with construction of this dam have been turned over to the Authority. These are, one for clearing the reservoir, another for construction of the north dike, and a third for supplying cement.

As a consequence of the transfer all bids received by the Bureau of Reclamation for the construction of Dam No. 2 (Arnold Dam) have been rejected, but will be turned over to the Lower Colorado River Authority, and if the Authority and bidders agree on terms, an award may be made by the Authority without readvertisement.

Colorado Aqueduct News

By Kay Campell

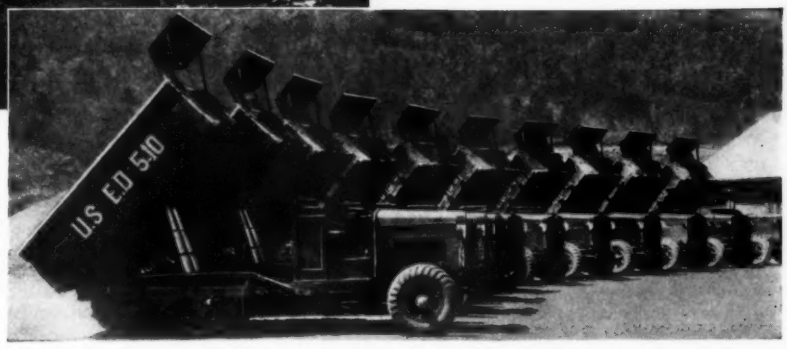
SEALED proposals for furnishing electric power transformers for 4 of the main pumping plants were received at the District Headquarters until July 29. Transformers for the Intake plant will be taken from the construction power system, but 4 transformers with a rated output of 22,000 kva each will be ordered for the Gene plant and 4 with a rated output of 5500 kva for the Iron Mountain plant, and 7 with a rated output of 15,000 kva

LINNS SCORED 100%

on these outstanding projects

View showing fleet of 10 LINNS now in use by U. S. Engineers at Waterbury, Vt., on the Vermont Flood Control project. LINNS also were used at Wrightsville and East Barre, Vt.

HAULAGE COSTS *take it on the chin* WHEREVER LINNS ARE USED....



It takes sturdy, tough equipment to handle the haulage assignments on tough jobs such as the Vermont Flood Control projects... the Tennessee Valley Authority... the Grand Coulee, Parker, Bonneville and Mohawk Dams... the Merritt Highway in Connecticut... and the Shenandoah — Smoky Mountain — Skyline. LINNS were chosen to do the heavy hauling on all these jobs, and scored 100%. Even during fall and spring, when mud and ooze kept other haulage equipment idle, the LINNS carried on... with capacity payloads and maximum yardage every day. When rough footing or severe grades were encountered... conditions which signal "red light" to other haulage units... the LINNS never faltered. For LINN'S exclusive flexible traction unit keeps loads moving without interruption in good going or bad ... in fair weather or foul. Thus, with no "hold-ups" to charge against LINN operation, haulage costs are bound to be low... and the job is sure of completion on time. If you want haulage equipment that will *earn more* by keeping haulage costs at new low levels, investigate the LINN. Ask us to send full details.

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• *Reinforcing steel "cages" are placed by force account on the Thousand Palms siphon of the Colorado River Aqueduct. These reinforcing forms have an inside diameter of 12 feet 4 inches, and are built in 10-foot sections. Concrete is poured in 40-foot sections. The machine in the center is placing inside forms.*

for the Eagle Mountain and Hayfield plants.

Staking is now completed on 231 miles of transmission line on the Boulder Dam-Aqueduct job, 165 miles of concrete footings have been placed and 16 miles of towers have been erected.

Broderick and Gordon crews have started drilling the outlet tunnel for Cajalco. This bore will have a diameter of 14 feet and will be approximately 2500 feet long.

Work on canals, conduits, and siphon sections east of San Jacinto has shut down for the summer, because of the high temperatures, however tunnel work will continue. Three open work units have been completed in all their details, including the Little Morongo Siphon, built by the United Concrete Pipe Company; the Fan Hill conduit and siphon unit built by the force account; and Schedule 20-C built by the Griffith Company.

On conduit sections 29.6 miles out of a total of 51.7 have been completed; 52 miles of canal out of 62.2 miles have been completed; and 19.8 miles of siphons out of a total of 26.3 miles have been completed. Work will recommence some time in September. Tunnel work is also progressing rapidly. Close to 90 out of a total of 92.04 miles of main aqueduct tunnel have been excavated; and more than 12 miles out of a total of 16.23 miles of distribution tunnel has been excavated, while a total of 43.05 miles of main aqueduct tunnel and .74 miles of distribution tunnel has been lined. Eleven tunnel contracts, involving 14 tunnels, have been completed.

Structural work on the Santa Ana river bridge, near Pedley will begin September 1, according to Dan Teeters who is subcontracting the job under the Western Pipe and Steel Company. The pipe line crossing on the bridge will be 9 feet, 8 inches in diameter and the contract calls for the use of 800,000 pounds of steel and 5500 yards of steel reinforced concrete.

Placement of concrete lining in the two diversion tunnels at Parker Dam is well under way.

• *No rooster needed here. Sunrise finds this Three Companies Bucyrus-Monighan walking dragline hard at work in the gravelly digging on schedule 12 of the Colorado River Aqueduct.*

Bartlett Dam Contract Awarded

CONTRACT for construction of Bartlett Dam, on the Verde River in Arizona, has been awarded to Barrett and Hilp of San Francisco and Macco Corporation of Clearwater, California, on their joint bid of $2,228,272.

The dam will be 270 feet high, the highest multiple arch dam in the world, will store 200,000 acre feet of water. Crest length of the dam will be 750 feet. Ten reinforced concrete arches will be supported by nine hollow reinforced concrete buttresses spaced 60 feet apart.

There will be a short gravity section at each abutment, the right one containing the concrete-lined, open-channel spillway.

The dam will serve the Salt River Federal Reclamation project.

B. F. Affleck Retires

EFFECTIVE September 1, B. F. Affleck has announced his retirement as president of the Universal Atlas Cement Company.

Born in Belleville, Illinois, he became a stenographer for the Illinois Steel Company in 1896. In 1901 he was made branch manager at St. Louis of the company's cement department which, in 1906 became a subsidiary of the U. S. Steel Corporation, with Affleck as general sales manager. In 1915, he was made president of the subsidiary com-

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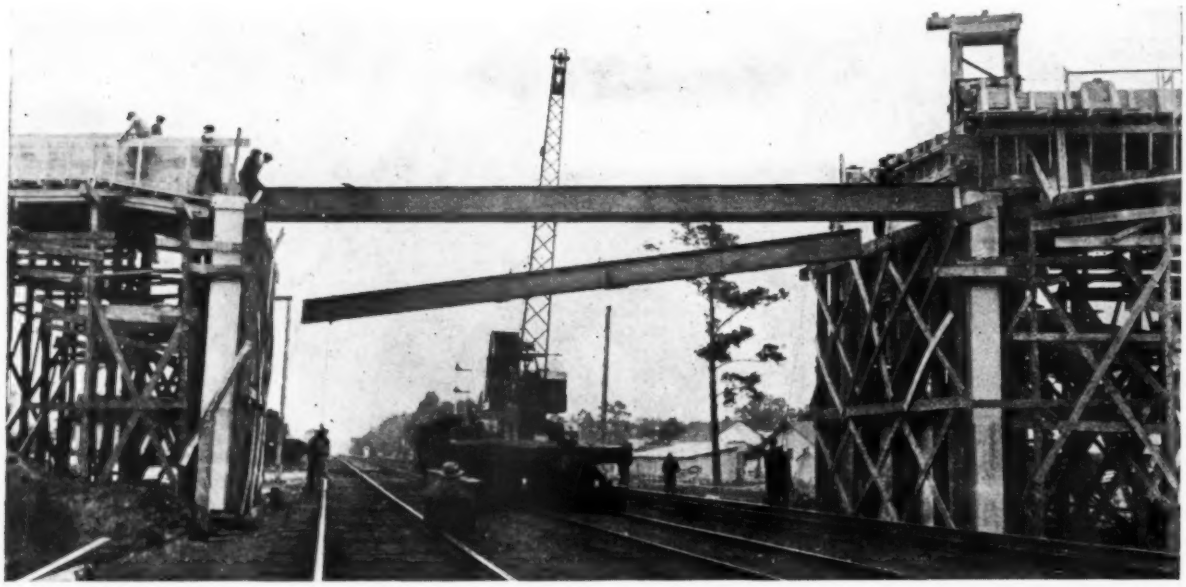


● *Working as a jack-of-all-trades, this Bucyrus-Erie 10-B built an overhead highway bridge across the A. C. L. Railroad at Hardeeville, South Carolina. In addition to placing the I beams as shown, the 10-B excavated the foundation and drove foundation piles. Wannamaker & Wells, Inc., of Orangeburg, S. C., were the contractors.*

pany whose business, during his term of service grew from 30,000 to 30,000,000 barrels annually.

One of the first to recognize the value of concrete for roads and streets, Affleck has been a consistent advocate of its use and has had great influence in our highway development.

Upon his retirement, he will be succeeded by Blaine S. Smith, recent president of the Pennsylvania-Dixie Cement Corporation. For over 20 years, preceding his presidency of that corporation, he was connected with the company he will now head.

Ohio Highway Prospects

THE year 1936 promises to be the best for Ohio highways since 1931, despite a late start in obtaining funds. Gas tax and license tax revenues have been limited to road and street application, assuring all counties and towns of funds which cannot be diverted. Already, many highway industries in the state have reported a business for the first half of 1936 exceeding total business for 1935.

To date, two distributions of the tag tax have been made. Total share going to counties amounted to $6,276,227; that going to municipalities totalled $2,201,925. Total share of the year's tag tax which will go to these two units will be $15,400,000.

Ohio has two gas taxes; 1½ cents for maintenance and repair, and a second 1½ cents for new construction. This revenue will be distributed in five lots to counties and townships. Additional funds from PWA, WPA, and regular Federal Aid for the second half of 1936 will swell the total available for roads and streets in Ohio to a sum which will mean plenty of work for contractors. Exclusive of PWA, the state will have over $30,350,000 available for 1936 construction, and $23,700,000 for maintenance.

Bureau of Mines Engineer Retires

AFTER 25-years service with the U. S. Bureau of Mines, O. P. Hood, chief engineer of the mechanical division has retired. He joined the Bureau at its Pittsburgh experiment station where he organized a system for testing and approving safety and efficiency of electrical equipment for use in gassy coal mines. In 1918, he moved to the Washington office and continued his work in the field of fuels and mechanical equipment. In 1926, Dr. Hood took on the additional duties of chief of the technologic branch of the Bureau and did excellent work in both positions.

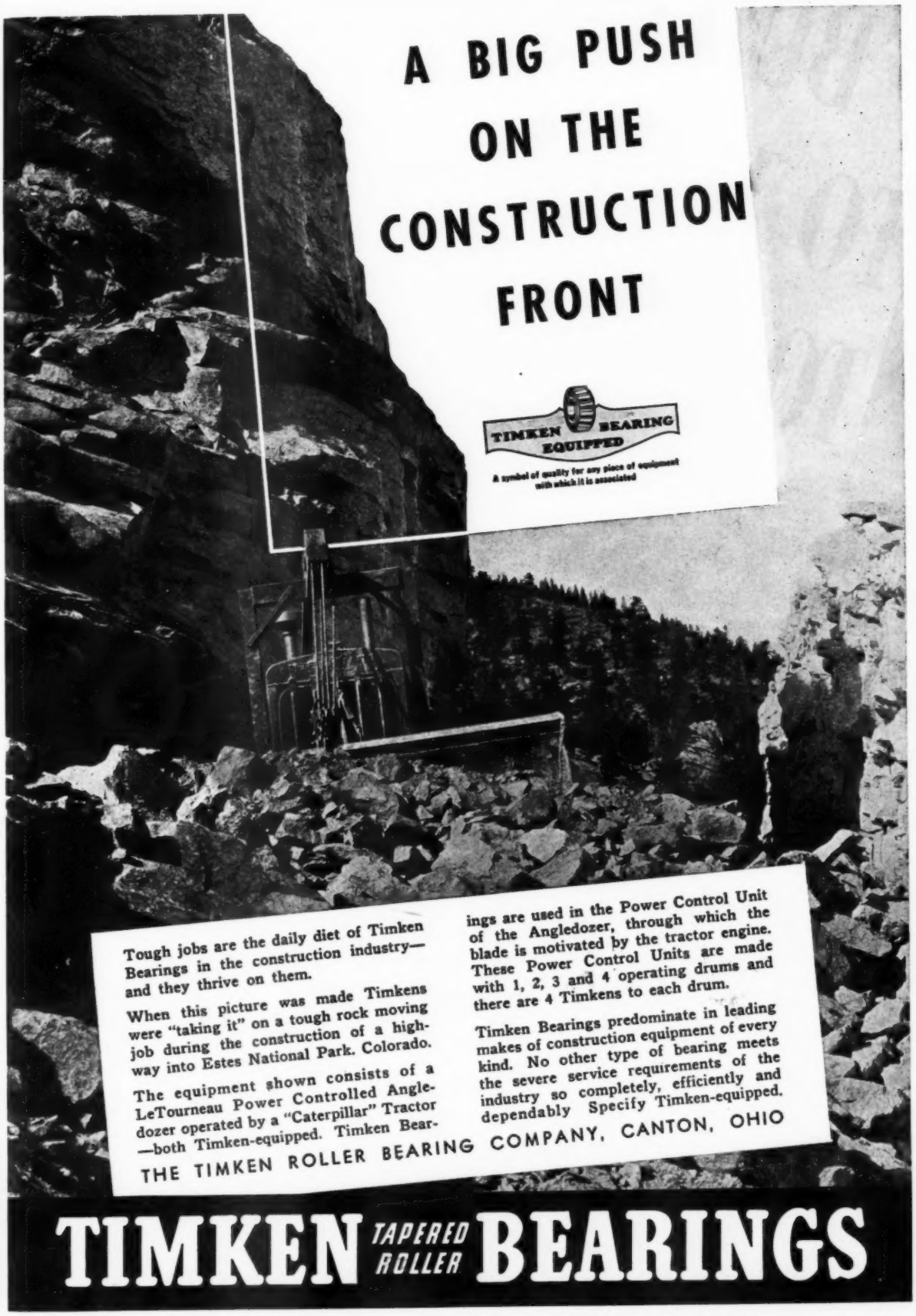
Arno C. Fieldner has been appointed to fill the position as chief of the technologic branch.

Plan to Convert Railway to Highway in Florida

BIDS will be advertised shortly for converting the Miami-Key West extension of the Florida East Coast railway into a highway route at a cost of $3,600,000. The section covered by the improvement will be from Lower Matecumbe Key to Torch Key, a distance of about 29.5 miles, to replace the present ferrier operating across the Florida Keys.

The work will consist of approximately 21 miles of roadway and 37,735 feet of concrete arches; 27,148 feet of plate girder spans, 4,334 feet of steel truss spans, and 302 feet of draw spans; plans are for a 20-foot roadway constructed of reinforced concrete slabs on the various types of present structures. Construction is being handled by the Overseas Road and Toll Bridge District in cooperation with the State Road Department Work is directly under the supervision of B. M. Duncan, General Manager Consulting Engineer.

● *The suspension span of the San Francisco Bay Bridge. San Francisco in the background. Yerba Buena Island at the right. Through this island a tunnel will carry bridge traffic.*



Tough jobs are the daily diet of Timken Bearings in the construction industry—and they thrive on them.

When this picture was made Timkens were "taking it" on a tough rock moving job during the construction of a highway into Estes National Park, Colorado.

The equipment shown consists of a LeTourneau Power Controlled Angledozer operated by a "Caterpillar" Tractor—both Timken-equipped. Timken Bearings are used in the Power Control Unit of the Angledozer, through which the blade is motivated by the tractor engine. These Power Control Units are made with 1, 2, 3 and 4 operating drums and there are 4 Timkens to each drum.

Timken Bearings predominate in leading makes of construction equipment of every kind. No other type of bearing meets the severe service requirements of the industry so completely, efficiently and dependably. Specify Timken-equipped.

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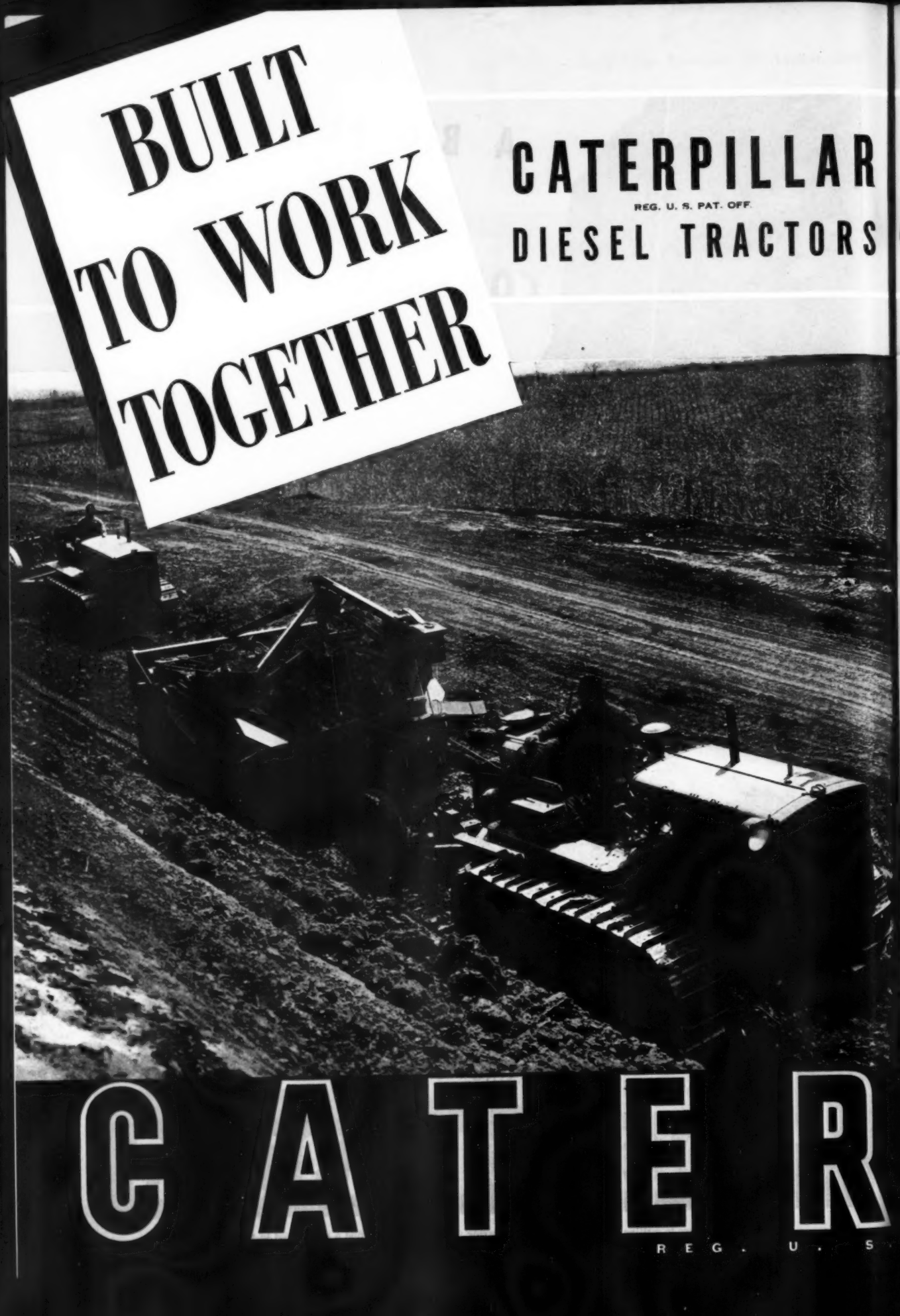
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This coupon will bring you complete information on the balanced equipment for the type of job you are doing. Mail it to Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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Gentlemen:

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Plenty of Work Ahead

CONGRESS, in passing the Wilson-Copeland omnibus bill, gave to the United States its first national flood control policy, and authorized construction of projects already investigated and approved by the Corps of Engineers in the principal watersheds of the country.

The estimated construction cost of these projects alone runs to $310,000,000. Although the bill does not provide a time limitation, it was understood in Congress that it is to be a ten-year program, with not more than $50,000,000 to be expended during the fiscal year beginning July 1, 1936. The President is empowered to determine the priority of the various projects.

Under the yardstick adopted by Congress, local interests must provide without cost to the United States all lands, easements and rights-of-way required for any flood control project; hold and save the United States free from damages due to construction works, and maintain and operate all works after completion.

Principal watersheds included in the omnibus bill for flood control treatment are the Susquehanna, Potomac, Red, Arkansas and tributaries, White and tributaries, Upper Mississippi, Illinois and tributaries, Ohio and tributaries, Wabash-White, Missouri and tributaries, Los Angeles-San Gabriel, Santa Ana, and Columbia and tributaries.

We give herewith a complete list of the projects authorized in the omnibus bill, their estimated construction cost, and the United States Engineer Offices presently assigned to handle them. Some idea of the quantity of work now assured can be gained from a study of the list. It should be remembered that, while all these projects have been authorized, actual funds to start construction have not yet been appropriated.

● *Dating back to the 1700's, this canal is still in use. It is owned by the Lehigh Coal & Navigation Company who hauled buckwheat and dust size coal over it in barges. The Lehigh River carries considerable silt into the canal, the two having a common channel at several points, and dredging is necessary to keep the canal navigable. The dipper of the dredge shown here has a capacity of about ⅝ of a yard.*

NORTH ATLANTIC REGION

FIRST N. Y. DISTRICT

Lamoille River, Vt: Channel improvement by reconstruction of Hardwick Dam, excavation at Johnsons Gorge and bank revetment at 12 places; estimated cost, $66,000. **Rutland, Vt., on Otter Creek:** Channel improvement by construction of dikes; estimated cost, $49,500. **Proctor, Vt. on Otter Creek:** Channel excavation and dam reconstruction; estimated cost, $22,500. **North Adams, Mass., on Hoosic River:** Channel clearing; estimated cost, $66,000. **Bennington, Vt., on Hoosic River:** Channel clearing; estimated cost, $216,000. **Hoosic Falls, N. Y., on Hoosic River:** Channel clearing; estimated cost, $43,000.

Southern New York and Eastern Pennsylvania: Construction of detention reservoirs and related flood control works to protect Binghamton, Hornell, Corning and other towns; estimated cost, $27,154,000.

BOSTON DISTRICT

Merrimack River, N. H., and Massachusetts: Construction of system of reservoirs; estimated cost, $7,725,000.

PROVIDENCE DISTRICT

Connecticut River Basin: Construction of ten reservoirs in Vermont and New Hampshire; estimated cost, $10,028,900.

CENTRAL ATLANTIC REGION

BALTIMORE DISTRICT

Williamsport, Pa.: Levees on West Branch of Susquehanna River; estimated cost, $2,444,000. **Harrisburg, Pa.:** Levees on Susquehanna River; estimated cost, $104,000. **Sunbury, Pa.:** Levees on Susquehanna River; estimated cost, $93,600. **York, Pa.:** Retarding dams and channel improvements; estimated cost, $2,210,000. **Milton, Pa.:** Levees on West Branch of Susquehanna River; estimated cost, $263,900. **Montgomery, Pa.:** Levees on West Branch of Susquehanna River; estimated cost, $139,100. **Muncy, Pa.:** Levees on West Branch of Susquehanna River; estimated cost, $360,800. **Jersey Shore, Pa.:** Levees on West Branch of Susquehanna River; estimated cost, $395,900.

Lock Haven, Pa.: Levees on West Branch of Susquehanna River; estimated cost, $2,860,000. **Bloomsburg, Pa.:** Levees on North Branch of Susquehanna River; estimated cost, $131,300. **West Pittston, Pa.:** Levees on North Branch of Susquehanna River, estimated cost, $100,000. **Swoyerville and Forty Fort, Pa.:** Levees on North Branch of Susquehanna River; estimated cost, $529,800. **Kingston and Edwardsville, Pa.:** Levees on North Branch of Susquehanna River; estimated cost, $1,658,200. **Plymouth, Pa.:** Levees on North Branch of Susquehanna River; estimated cost, $628,000. **Nanticoke, Pa.:** Levees on North Branch of Susquehanna River; estimated cost, $381,700. **Wilkes-Barre and Hanover Township, Pa.:** Levees on North Branch of Susquehanna River; estimated cost, $2,129,400.

WASHINGTON DISTRICT

Washington, D. C.: Levees and grade raising to protect downtown Washington, Arlington Experimental Station, Bolling Field, and Anacostia Naval Air Station on Potomac River; estimated cost, $571,000. **Cumberland, West Cumberland, South Cumberland, Md., and Ridgeley, W. Va.:** Levees retaining wall, movable dam, and channel clearing on Potomac River; estimated cost, $743,400. **Moorefield, W. Va.:** Levees on Moorefield River; estimated cost, $41,500. **Harpers Ferry, W. Va.:** Levees on Potomac River and concrete flood wall; estimated cost, $164,900.

WILMINGTON DISTRICT

North Carolina: Channel improvements on Tar River between Tarboro and Rocky Mount for flood relief; estimated cost, $82,500.

SOUTH ATLANTIC REGION

SAVANNAH DISTRICT

Augusta, Ga.: Levees and retaining walls on Savannah River; estimated cost, $685,000.

MOBILE DISTRICT

Brewton, Ala.: Levees on Escambia River; estimated cost, $235,000. **Flomaton, Ala.:** Levees on Escambia River; estimated cost, $149,000. **Rome, Ga.:** Levees on Coosa River; estimated cost, $330,000. **Ittawamba County, Miss., near Fulton:** Clear floodway on Tombigbee River; estimated cost, $109,000. **Jackson and vicinity, Miss.:** Clear flood channel on Pearl River; estimated cost, $10,000.

SECOND NEW ORLEANS DISTRICT

Homochitto River, Adams and Wilkinson Counties, Miss.: Small earth dams at heads on

● *R. J. Reid Construction Company of Birmingham, Alabama used these two Bucyrus-Erie draglines in building this section of the London Avenue Canal in New Orleans. The job, let by the New Orleans Sewerage & Water Board, cost about $500,000.*

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★More than 90 per cent of all electric shovels manufactured by the two leading shovel manufacturers are equipped by General Electric.

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GENERAL ELECTRIC

For your convenience in writing to General Electric, you will find a card bound in this issue.

• Sulton Company, Inc., uses this International Tractor and Bucyrus-Erie Bullgrader on cleanup work at Tygert Dam, near Grafton, West Virginia. The dam required 274,160 yards of common and 150,000 yards of rock excavation, and is being constructed under a $6,426,298.22 contract.

minor tributaries and channel improvement; estimated cost, $50,000. **Buffalo River, Wilkinson County, Miss.:** Channel improvements; estimated cost, $35,000. **Bayou des Glaises, La.:** Diversion ditch from Moreauville to borrow pit of West Atchafalaya levee at Lake Bayou; estimated cost, $280,000.

VICKSBURG DISTRICT

Big Black River, Miss.: Improvement of flood channel in Choctaw, Webster, Montgomery, Attala, Carroll, Holmes, Yazoo, Warren, Claiborne and Hinds Counties; by means of channel clearing and suitable cut-offs; estimated cost, $850,000. **Red River Parish, below Shreveport, La.:** Raising, enlarging and extending existing levee system on Red River; estimated cost, $150,000. **Bayou Pierre, La.:** Channel enlargement on Red River from Bayou Wincey to mouth at Grand Encore; estimated cost, $300,000. **Natchitoches Parish, La.:** Levees on west side of Red River, dam and flood gate at mouth of Cane River, and drainage ditches; estimated cost, $315,000. **Saline Point, Avoyelles and Catahoula Parishes, La.:** Cut-off in Red River to reduce flood heights; estimated cost, $135,000. **Black Bayou, La.:** Earth dam and reservoir for flood storage, estimated cost, $125,000. **Bayou Badcau, La.:** Floodway for diversion of Bayou Badcau and Cypress Bayou; estimated cost, $1,825,000. **Wallace Lake, La.:** Earth dam and reservoir; estimated cost, $380,000. **Columbia, La.:** Levees, bulkhead and drainage structures on Ouachita River; estimated cost, $339,100. **Jonesville, La.:** Levee, retaining wall and drainage structures on Ouachita River; estimated cost, $368,200.

SOUTH CENTRAL REGION

TUCUMCARI DISTRICT

Conchas Reservoir near Tucumcari, on the South Canadian River in New Mexico: For completion of project now under way for flood control, irrigation and water supply benefits in New Mexico; estimated cost, $12,270,000.

MEMPHIS DISTRICT

Tiptonville to Obion River, Tenn.: Levees on Mississippi River to protect Tiptonville, Ridgely and various smaller communities; estimated cost, $730,000. **Caddoa Reservoir, near Lamar in Colorado:** For flood control and water conservation in Colorado and Kansas; estimated cost, $9,700,000. **Optima Reservoir on North Canadian River:** For flood control in the North Canadian Valley in Oklahoma; estimated cost, $1,350,000. **Fort Supply Reservoir on North Canadian River:** For flood control in North Canadian Valley in Oklahoma; estimated cost, $2,360,000. **Hulah Reservoir on Caney River tributary of Verdigris River,** Oklahoma and Kansas: For flood control in Verdigris River Valley in Oklahoma and for water supply purposes; estimated cost, $1,325,000. **Great Salt Plains Reservoir on Salt Fork of Arkansas River in Oklahoma:** For flood control and incidental benefits in Oklahoma; estimated cost, $972,000. **Kaw, on Arkansas River in Oklahoma:** Levees; estimated cost, $32,500. **Near Fort Gibson on Arkansas River** in Oklahoma: Levees; estimated cost, $7,900. **Near Dardenelle on Arkansas River** in Arkansas: Raising and enlarging existing levees; estimated cost, $93,500.

Little Rock, Ark.: Levees on Arkansas River; estimated cost, $110,500. **Pulaski County, Ark.:** Levees and flood wall on Arkansas River; estimated cost, $401,000. **North Little Rock to Gillette, Ark.,** on the North bank of the Arkansas River: Levees; estimated cost, $2,424,400. **Clarksville, on Spadra Creek,** tributary of Arkansas River in Arkansas: Levees; estimated cost, $70,000. **West of Morrillton on Arkansas River** in Arkansas: Levees; estimated cost, $603,000. **Faulkner County, on Arkansas River:** Levees; estimated cost, $100,000. **Winfield, on Walnut River in Kansas:** Levees; estimated cost, $108,000. **Augusta, on Walnut River** in Kansas: Levees; estimated cost, $109,800. **Hutchinson, on Arkansas River** in Kansas: Diversion of Cow Creek and levees; estimated cost, $1,050,000.

Wichita and Valley Center on Arkansas River in Kansas and vicinity: Levees and floodway; estimated cost, $2,603,100. **Big Slough to Belle Plaine, on Ninnescah River,** tributary of Arkansas River: Floodway and levees; estimated cost, $1,650,200. **Florence, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $17,000. **Cottonwood Falls, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $7,200. **Emporia, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $22,700. **Neosho Rapids, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $38,900. **Hartford, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $43,200. **Burlington, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $27,000. **Leroy, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $9,600.

Neosho Falls, on Grand (Neosho) River in Kansas: Levees; estimated cost, $32,400. **Iola, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $20,700. **Humboldt, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $19,300. **Chetopa, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $28,600. **Cherokee County, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $234,000. **Lyon County, on Grand (Neosho) River** in Kansas: Levees; estimated cost, $237,100. **West of Fredonia, on Fall River,** tributary of Verdigris River in Kansas: estimated cost, $189,900. **West of Benedict, on Verdigris River,** in Kansas: Levees; estimated cost, $195,000. **West of Elk City, on Elk River,** tributary of Verdigris River, in Kansas: Levees; estimated cost, $81,400. **Caney Creek,** tributary of Verdigris River, in Oklahoma and Kansas: Levees; estimated cost, $157,600.

Verdigris River from mouth to Madison, Kansas: Channel clearing in Kansas and Oklahoma for flood reliefs; estimated cost, $231,800. **Blackwell, on Chikaskia River,** tributary of the Salt Fork River, in Oklahoma: Levees; estimated cost, $50,000. **East Poplar Bluff and Poplar Bluff,** on Black River in Missouri: Leveed floodway; estimated cost, $546,800. **Poplar Bluff, on Black River in Missouri,** to latitude of Knoble, Ark.: Leveed floodway; estimated cost, $1,972,000. **Little Black River in Missouri and Arkansas:** Levees; estimated cost, $754,900. **Skaggs Ferry, on Black River,** east of Pocahontas, in Arkansas: Levees; estimated cost, $63,000. **Big Bottom, on White River,** in Independence County, Arkansas: Levees; estimated cost, $128,700. **Newport, on White River,** in Arkansas: Levees; estimated cost, $138,600. **Village Creek, White River and Mayberry District,** in Arkansas: Levees; estimated cost, $931,500. **Clarendon to Laconia Circle,** on White River, in Arkansas: Levees; estimated cost, $8,960,000. **Big Creek and L'Anguille River,** northwest of Marianna, in Arkansas: Levees; estimated cost, $86,400.

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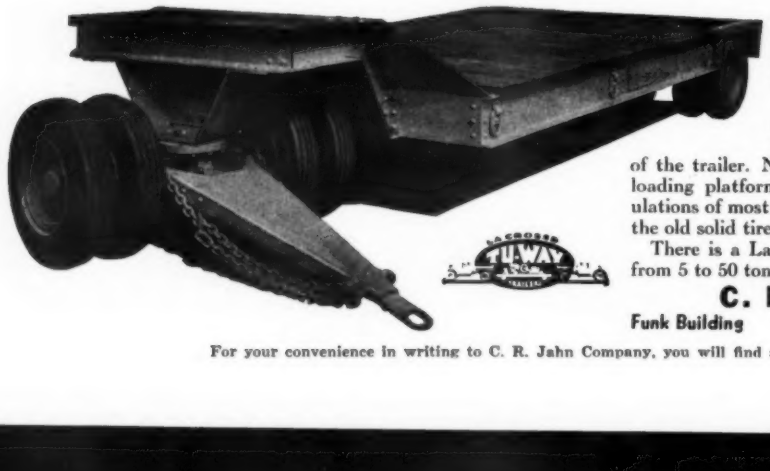

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CENTRAL REGION

ST. LOUIS DISTRICT

East St. Louis, Ill., and vicinity: Raise and enlarge existing levees; estimated cost, $1,158,000. **East Cape Girardeau and Clear Creek Drainage District,** Illinois: Raise and enlarge existing levees; estimated cost, $395,000. **North Alexander Drainage and Levee District,** Illinois: Raise and enlarge existing levees; estimated cost, $271,000. **Clear Creek Drainage and Levee District, Illinois:** Raise and enlarge existing levees; estimated cost, $649,000. **Preston Drainage and Levee District,** Illionis: Raise and enlarge existing levees; estimated cost, $244,000. **Degognia and Fountain Bluff Levee and Drainage District,** Illinois: Raise and enlarge existing levees; estimated cost, $330,000. **Perry County Drainage and Levee Districts Numbered 1, 2 and 3,** Missouri: Raising and enlarging existing levees; estimated cost, $859,000. **Saint Genevieve Levee District No. 1,** Missouri: Raise and enlarge existing levees; estimated cost, $177,000.

Fort Chartres and Ivy Landing Drainage District No. 5, Illinois: Raise and enlarge existing levees; estimated cost, $120,000. **Harrisonville and Ivy Landing Drainage and Levee District No. 2,** Illinois: Raise and enlarge existing levees; estimated cost, $453,000. **Columbia Drainage and Levee District No. 3,** Illinois: Raise and enlarge existing levees; estimated cost, $546,000. **Wilson and Wenkel and Prairie du Pont Drainage and Levee Districts,** Illinois: Raise and enlarge existing levees; estimated cost, $520,000. **Choteau, Namcoki, and Venice Drainage and Levee Districts,** Illinois: Raise and enlarge existing levees; estimated cost, $132,000. **St. Louis County Drainage and Levee District,** Missouri: Raise and enlarge existing levees; estimated cost, $259,000. **Wiedmer Chemicals Drainage and Levee District,** Missouri: Raise and enlarge existing levees; estimated cost, $76,500.

Between Beardstown, Ill., and mouth of Illinois River: Levee setback and floodway improvements; estimated cost, $730,000. **Lost Creek Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $46,100. **Big Lake Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $52,500. **Seahorn Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $32,000. **Lacey, Langellier, West Matanzas, and Kerton Valley Drainage and Levee District,** Illinois: Set back and improve existing levees; estimated cost, $188,400. **Rocky Ford Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $47,900. **Thompson Lake Drainage District,** Illinois: Improve existing levees; estimated cost, $351,000. **Kelly Lake Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $100,200.

ROCK ISLAND DISTRICT

Green Island Levee and Drainage District No. 1, Iowa: Raise and enlarge existing levees; estimated cost, $68,000. **Carroll County Levee and Drainage District No. 1,** Illinois: Raise and enlarge existing levees; estimated cost, $13,200. **Kelthsburg Drainage District,** Illinois: Raise and enlarge existing levees; estimated cost, $11,000. **Henderson County Drainage District No. 3, Illinois:** Raise and enlarge existing levees; estimated cost, $13,600. **Green Bay Levee and Drainage District No. 2,** Iowa: Raise and enlarge existing levees; estimated cost, $100,000. **Gregory Drainage District,** Missouri: Raise and enlarge existing levees; estimated cost, $44,400. **Fabius River Drainage District, Missouri:** Raise and enlarge existing levees; estimated cost, $82,000. **South Quincy Drainage and Levee District,** Illinois: Raise and enlarge existing levees; estimated cost, $46,000. **South River Drainage District,** Missouri: Raise and enlarge existing levees; estimated cost, $37,000. **Sny Island Levee District,** Illinois: Raise and enlarge existing levees; estimated cost, $71,000. **Riverland Levee District,** Missouri: Raise and enlarge existing levees; estimated cost, $73,000.

Rock River Basin—Penny Slough near Hillsdale, Ill.: Levee and drainage ditches; estimated cost, $109,000. **Rock River Basin**—Jonesville and Indian Ford Dams, Wisconsin: Floodgates; estimated cost, $29,000. **Freeport on Pecatonia River** in Illinois: Channel rectification; estimated cost, $463,000.

ST. PAUL DISTRICT

Dry Run Reservoir near Decorah, Iowa: estimated cost, $91,000. **Lake Traverse and Bois De Sioux River,** South Dakota: Reservoir for flood protection and water conservation; estimated cost, $1,115,000. **Lac Qui Parle Reservoir,** in Minnesota: For flood protection in valley of Minnesota River, estimated cost, $464,000.

CHICAGO DISTRICT

Liverpool Drainage and Levee District, Illinois: Improve existing levees; estimated cost, $48,600. **Hennepin Drainage and Levee District,** Illinois: Levee and channel improvements; estimated cost, $46,800. **Banner Special Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $128,700. **Pekin and La Marsh Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $145,300. **Spring Lake Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $384,200. **East Liverpool Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $137,700. **East Peoria Drainage and Levee District,** Illinois: Improve existing levees; estimated cost, $29,000. **Mouth of Sangamon River,** Illinois: Clearing and enlarging flood channel; estimated cost, $122,400. **Sangamon River from mouth of Salt Creek to Robey,** Illinois: Channel straightening for flood relief; estimated cost, $773,000. **Salt Creek in vicinity of Middleton, Illinois:** Channel straightening; estimated cost, $48,000. **East of Hubley Bridge on south side of Salt Creek,** Illinois: Raise and improve existing levees; estimated cost, $20,300. **Swager, Whitney, Young-Holbite Levee on north side of Salt Creek,** Illinois: Improve existing levees; estimated cost, $10,200. **Donavon Levee on north side of Salt Creek,** Illinois: Improve existing levee; estimated cost, $28,400. **Mason and Menard Drainage District** on Sangamon River near Oakford, Illinois: Improve existing levees; estimated cost, $78,900. **Tar Creek Levee, west of Oakford,** Illinois: Improve existing levees; estimated cost, $34,800. **Watts Levee on south side of Salt Creek,** Illinois: Improve existing levees; estimated cost, $34,400. **Farmers Levee and Drainage District** on north side of Sangamon River, Illinois: Improve existing levees; estimated cost, $242,600. **Clear Lake Levee and junction of Sangamon and Illinois Rivers** in Illinois: Improve existing levees; estimated cost, $69,250. **Oakford Special Drainage District** on south side of Sangamon River in Illinois: Improve existing levees; estimated cost, $25,500. **Near Springfield on Sangamon River,** Illinois: Alteration of Chicago & Illinois Railroad bridge to improve flood channel; estimated cost, $90,000. **Panther Creek West Side Levee,**

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Illinois: Levees; estimated cost, $143,000. **Bell and Mertz Levees,** Panther Creek and Sangamon River, Illinois: Improve existing levees; estimated cost, $31,100. **Kankakee River Basin,** between Shelby Bridge and Baums Bridge in Indiana: Levees; estimated cost, $176,600.

PITTSBURGH DISTRICT

Ohio River Basin—Construction of reservoirs for Allegheny-Monongahela Basin to protect Pittsburgh and reduce flood heights in Ohio Valley generally; estimated cost, $20,646,000.

CINCINNATI DISTRICT

Ohio River Basin—Construction of five reservoirs below Pittsburgh: estimated cost, $19,616,800.

LOUISVILLE DISTRICT

Indianapolis, Walfleigh section, on west fork of White River, Indiana: Levees, bridge reconstruction and channel improvement; estimated cost, $1,020,000. **Indianapolis, Fall Creek section,** on West Fork of White River, Indiana: Levees, bridge reconstruction and channel improvement; estimated cost, $540,000. **Wabash, on Wabash River,** Indiana: Levees and bridge reconstruction; estimated cost, $205,000. **Peru, on Wabash River,** Indiana: Improvement of levees, flood wall and bridge changes; estimated cost, $1,720,000. **Anderson, on West Fork of White River,** Indiana: Levees, flood wall, bridge changes and drainage improvements; estimated cost, $127,000. **Muncie, on West Fork of White River, Indiana:** Flood wall, bridge changes, and channel improvements; estimated cost, $840,000. **Shoals, on East Fork of White River,** Indiana: Levees; estimated cost, $127,000. **Terre Haute, on Wabash River,** Indiana; Levees; estimated cost, $37,500. **Lyford Levee Unit on Wabash River,** Indiana: Improve existing levees; estimated cost, $84,650.

Levee Unit No. 10, on West Fork of White River, Indiana: Improve existing levees, estimated cost, $39,000. **Gill Township Levee Unit on Wabash River,** Indiana: Improve existing levees; estimated cost, $180,250. **Levee Unit No. 2, on Wabash River,** Indiana: Improve existing levees; estimated cost, $734,900. **Levee Unit No. 1 on Wabash River,** Illinois: Improve existing levees; estimated cost, $812,225. **Levee Unit No. 3 on East Fork of White River,** Indiana: Improve existing levees; estimated cost, $634,475. **Levee Unit No. 5 on Wabash River,** Indiana: Improve existing levees; estimated cost, $1,339,500. **Levee Units Nos. 3 and 4 on Wabash River,** Illinois: Improve existing levees; estimated cost, $1,580,000. **Levee Unit No. 8 on West Fork of White River,** Indiana: Improve existing levees; estimated cost, $376,000. **Brevoort Levee Unit on Wabash River,** Indiana: Improve existing levees; estimated cost, $976,500.

NASHVILLE DISTRICT

Pineville, on Cumberland River, Kentucky: Levees; estimated cost, $444,200. **Middlesboro, on Cumberland River,** Kentucky: Levees; estimated cost, $536,000. **Kansas City on Missouri and Kansas Rivers** in Missouri and Kansas: Levees and flood walls; estimated cost, $10,000,000.

NORTHWESTERN REGION

OMAHA DISTRICT

Council Bluffs near confluence of Indian Creek with Missouri River, Iowa: Channel improvements; estimated cost, $1,532,300.

Belle Fourche at confluence of Belle Fourche and Redwater Rivers, tributaries of Cheyenne River, South Dakota: Levees; estimated cost, $24,100. **Forsyth and vicinity on Yellowstone River, Montana:** Levees; estimated cost, $65,900. **Wilbaux River on Beaver Creek,** tributary of Little Missouri River, Montana: Levees; estimated cost, $42,300. **Marmath on Little Missouri River,** North Dakota: Levees; estimated cost, $21,700.

KANSAS CITY DISTRICT

Topeka, on Kansas River, Kansas: Levees and flood wall; estimated cost, $845,300. **Lawrence, on Kansas River,** Kansas: Levees; estimated cost, $163,100.

FT. PECK DISTRICT

Saco on Milk River, Montana: Levees; estimated cost, $26,800. **Glasgow on Milk River,** Montana: Levees; estimated cost, $25,800. **Harlem on Milk River,** Montana: Levees; estimated cost, $9,700.

SOUTHERN PACIFIC REGION

LOS ANGELES DISTRICT

Los Angeles and San Gabriel Rivers, California: Construction of reservoirs and principal flood channels; estimated cost, $70,000,000. **Santa Ana River,** California: Construction of reservoirs and related flood control works for protection of metropolitan area in Orange County; estimated cost, $13,000,000.

SAN FRANCISCO DISTRICT

Eel River, California: Construction of current retards and levees; estimated cost, $144,000.

NORTHERN PACIFIC REGION

FIRST PORTLAND DISTRICT

Columbia River Basin—Raise and improve existing levees in Diking and Improvement District No. 5, Cowlitz County, Washington, estimated cost, $251,500; same in Consolidated Diking and Improvement District No. 1, Cowlitz County; estimated cost, $286,200. **Columbia River Basin**—Raise and improve existing levees in Wahkiakum County, Washington; Diking Districts Nos. 1 and 3; estimated cost, $193,000; same in Diking District No. 1 (Little Island); estimated cost, $26,000; same in Diking and Improvement District No. 4; estimated cost, $150,200.

Columbia River Basin—Raise and improve existing levees in Pacific County Diking District, Washington; estimated cost, $22,700. **Columbia River Basin**—Raise and improve existing levees in Multnomah County, Oregon: Sandy Drainage District; estimated cost, $92,000; same in Multnomah Drainage District No. 1; estimated cost. $547,400; same in Peninsular Drainage District No. 1; estimated cost, $133,300; same in Peninsular Drainage District No. 2: estimated cost, $287,200.

Columbia River Basin—Raise and improve existing levees in Columbia County, Oregon; Scappoose Drainage District; estimated cost, $329,400; same in Rainier Drainage District, estimated cost, $25,700; same in Beaver Drainage District, estimated cost, $216,600; same in McGruder Drainage District, estimated cost, $33,200; same in Midland Drainage District, estimated cost, $62,600; same in Marshland Drainage District, estimated cost, $60,100; same in Webb Drainage District, estimated cost, $61,100; same in Woodson Drainage District, estimated cost, $19,100.

Columbia River Basin—Raise and improve existing levees in Clatsop County, Oregon: Westport District, estimated cost, $27,200, Tenashillahe Island, estimated cost, $54,700; Blind Slough, miscellaneous dikes, estimated cost, $92,200; Drainage District No. 1, estimated cost. $107,900; Knappa Area, miscellaneous dikes, estimated cost, $8,200; Karlson Island, estimated cost, $35,000; John Day River dikes, estimated cost, $27,800; Walluskia River dikes, estimated cost, $68,200; Youngs River dikes, estimated cost, $217,100; Diking District No. 2, estimated cost, $39,400; Diking District No. 3, estimated cost, $4,500; Diking District No. 5, estimated cost, $12,900; Lewis and Clark River Dikes, estimated cost, $88,000; Warrenton Diking District No. 1, estimated cost, $23,000; Warrenton Diking District No. 2, estimated cost, $41,900; Warrenton Diking District No. 3, estimated cost, $14,900.

Columbia River Basin—New Levees in Wahkiakum County, Washington: Skamokawa Creek Area, estimated cost, $99,200; Upper Grays River Area, estimated cost, $78,200; Deep River Area, estimated cost, $46,800. **Columbia River Basin**—New levees on Sauvie Island (areas A and B) in Multnomah County, Oregon: estimated cost, $1,364,900. **Columbia River Basin**—New levees in Columbia County, Oregon: Deer Island area, estimated cost, $281,600; Prescott area, estimated cost, $281,600; Westland area, estimated cost, $116,600.

Willamette River Basin—Construction of bank protection works, with channel clearing on the Willamette, Clackamas, Tualatin, Molalla, Santiam, Marys, Muddy and McKenzie Rivers in Oregon; estimated cost, $2,430,000.

SECOND PORTLAND DISTRICT

Lewis River: Improve existing flood control works in Cowlitz County Diking Improvement District No. 1, Washington; estimated cost, $208,000. **Cowlitz River:** Improvement of existing works in Cowlitz County, Washington: Diking, Drainage and Improvement Districts No. 1, 2 and 13; estimated cost, $210,400. **Umatilla River:** Construction of flood control works at Pendleton, Oregon; estimated cost, $200,000.

SEATTLE DISTRICT

Stillaguamish River: Improvement of flood channel by clearing and bank revetment at 26 places; estimated cost, $261,000. **Upper Puyallup River,** Washington: Bank protection; estimated cost, $50,000. **Mud Mountain Reservoir,** on White River, Washington: estimated cost, $3,177,000. **Tacoma, on Puyallup River,** Washington: Channel improvement to protect industrial area; estimated cost, $894,000. **Skagit River:** Construction of Avon cut-off in Washington for the diversion of flood waters from Skagit River to Padilla Bay for protection of lower river valley; estimated cost, $3,150,100.

The bride of a few weeks noticed that her husband was depressed.

"Gerald, dearest," she said, "I know something is troubling you, and I want you to tell me what it is; your worries are not your worries now, they are our worries."

"Oh, very well," he said. "We've just had a letter from a girl in New York, and she's suing us for breach of promise."

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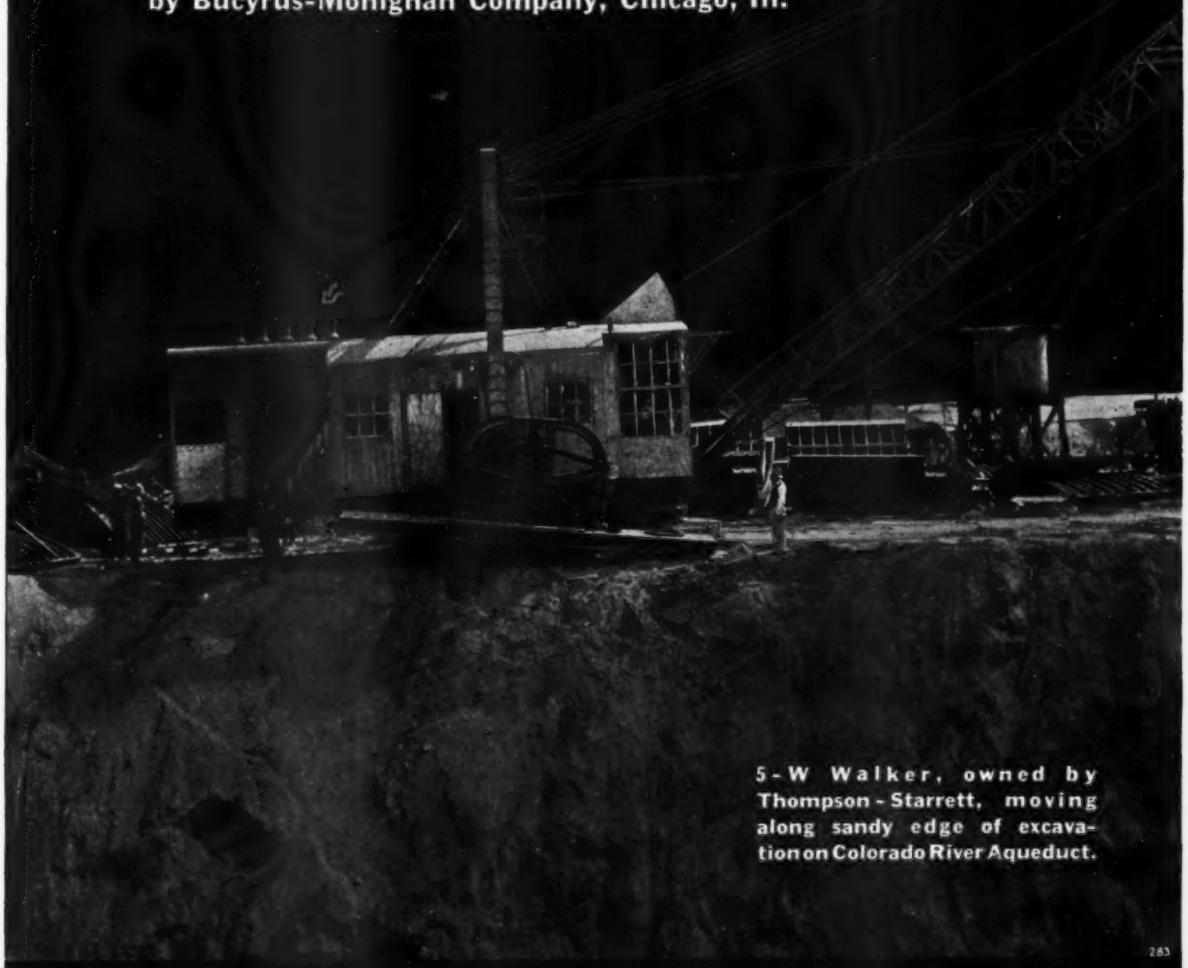
welcomes work in restricted areas. When the spoil bank gets so close to the edge of the excavation that any other type dragline would have difficulty in moving . . . except parallel to the excavation . . . that's where the Walker proves its mettle. The operator touches the controls . . . and the Walker steps away sharply at any angle and without maneuver. Manufactured by Bucyrus-Monighan Company, Chicago, Ill.



5-W Walker, owned by Thompson-Starrett, moving along sandy edge of excavation on Colorado River Aqueduct.

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Excavating for Grand Coulee

(Continued from page 401)

by the operators, each of whom handles two stations. One oiler takes care of the lubrication during the day shift, making a complete round of the system in a week. Three mechanics are always on duty at the stacker, belt and hub house. All together, on the west bank system, from 27 to 40 operators, mechanics and carpenters are used per shift.

The west cofferdam, rushed to completion through sub-zero weather in order to be ready for the highwater, was finished early in April, 1934, and excavating began immediately. The building of this cofferdam is a story of remarkable achievement in itself, but space prevents us from telling it here. Three thousand feet long, and requiring 13,000 tons of steel sheet piling, it is the world's largest cofferdam.

Sixty-six Acres of Digging

Material to be excavated in the cut behind this cofferdam had a top area of 66½ acres and an average depth of 145 feet. Maximum depth to bed rock was 245 feet. For the first 100 feet, material was sand and gravel. Then came a layer of clay with cemented gravel, below which was a densely compacted lava dust of clay-like characteristics, and containing occasional large boulders of extreme hardness. While these had to be drilled and shot—and the drilling was a slow process—the number of boulders was not large enough to provide a serious impediment to progress. The clay itself was moist and heavy, and so cohesive as often to be difficult to break up at the grizzlies. However, it presented no problem for the shovels. As far as they were concerned, the digging was simply a matter of rhythmic loading of dipper after dipper.

MWAK handled the bulk of the excavation with 6 electric shovels, two Bucyrus-Erie 120-B's with 5-yard dippers, two 4-yard, and two 3-yard Marions. Several smaller machines occasionally helped out, but were principally used for crane and miscellaneous duty.

How the Dirt Moved in a Steady Stream

The shovels loaded trucks and tractor-drawn crawler wagons which dumped on the grizzlies, often "on-the-fly." A continuous circle of hauling equipment—from shovel to grizzly and back to shovel again—was so efficiently maintained that waits for either shovels or hauling equipment were rare indeed. When a load had been dumped over a grizzly, a tractor equipment with bulldozer swung in to crush the material between the bars and to push oversize rock aside where it could be loaded by one of the smaller shovels and trucked away. Because of the rough treat-

• *Considering the slippery nature of material excavated, it was particularly important that the cofferdams keep out all water. Rivet holes and other openings in the steel sheet piling were electric welded.*

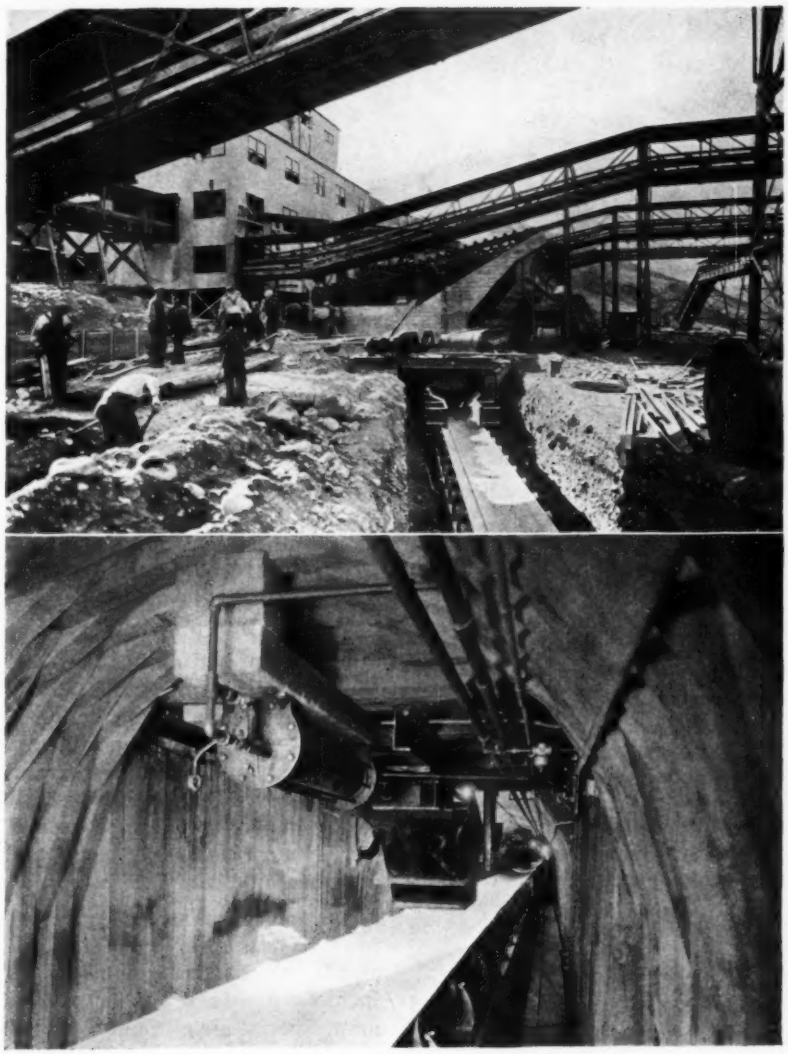
• *On the suspension bridge, shown before it was finished, gravel and aggregate was moved by belt conveyor across the river to the west abutment. To the left is the trestle carrying the main conveyor from the east bank excavation to the main line which can be seen heading up the bank toward Rattlesnake Canyon.*

• *Top: MWAK crushing and screening plant on the east bank of the Columbia. Aggregate was carried across the river on belt conveyors. Bottom: A detailed view of the belt which carried the aggregate.*

ment the heavy manganese steel bars of the grizzlies gave, the regular plates with which the tractors were first equipped wore out and broke so rapidly that they had to be replaced with smooth "shoes." These gave satisfactory service as they could not catch on the bars.

While the predominating clay was "duck soup" for the shovels, it tended to make the going tough for the hauling equipment, due to its slippery quality. Rain would result in a film of slick "grease" over the excavating surface which caused trucks to bog down and tractors to slip and skid. This film was removed by bulldozers. Fortunately, no excessively rainy weather was encountered, or serious shutdowns might have been necessary. The contractor foresaw the difficulties that the slippery clay might offer, and for this reason early decided to standardize on tractor-drawn hauling equipment. Trucks were added later, however, when it became evident that they could be used.

No attempt was made to provide regular hauling roads, as they would have had to be changed nearly every shift. An Austin-Western grader, and Allis Chalmers and Caterpillar tractors with LeTourneau and Athey bulldozers were available, but, for the most part, the hauling equipment "rolled its own" roads.

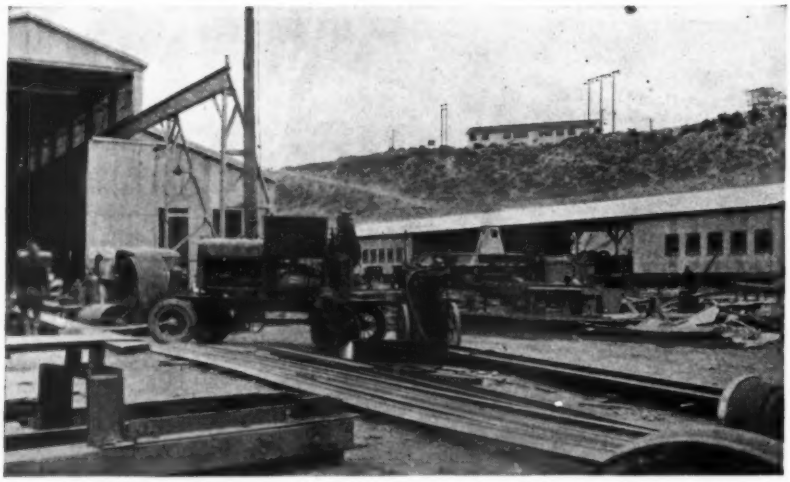


Ingenious Maintenance System

Operations were carried on in three 7-hour shifts, with a one-hour interval between each two. This set-up provided an hour which could be used in an emergency without running into overtime. It also made it possible for C. E. Ferguson, master mechanic of shovels, to install a maintenance system which resulted in an average operating efficiency of about 95 per cent. That is, in a typical month, the 6 shovels actually worked 2,288 out of a possible 2,400 hours.

Three maintenance crews, each working an eight-hour shift, and each composed of a foreman, two mechanics and two helpers, were used. Each maintenance crew's shift began with the "noon" hour of a seven-hour operating shift, and was so arranged that the incoming crew worked through this hour with the outgoing one. Thus, two complete crews were available for each hour the shovels were not in operation. All repairs were made by these crews, the shovel runners doing nothing but "bail" the dirt. Between the off hours, the maintenance crew on duty cruised over the job, making necessary emergency repairs, wherever possible without stopping the shovels, and lining up the work to be done during the next free hour. This continual inspection insured that no trouble could get much of a start and that operating time and elapsed

• *Another dipper of clay and shale starts its long trip to Rattlesnake Canyon. Dippers on MWAK's electric shovels sliced through the prevailing sticky clay like a knife through cheese.*



• A completely maintained shop on the east bank helped to cut delays to a minimum. This view shows one of the portable compressors in the welding yard just outside the shop.

time would approach each other as nearly as possible. Each shovel carried a spare cable and spare dipper teeth so that these replacements could be made with a minimum delay.

A special feature of the dipper teeth used was the nickel-alloy wearing plates which were welded on them. These aided in keeping the teeth continually sharp, and lasted as long as 560 hours in the relatively easy digging encountered. When the plates wore down they were burned off and new ones welded to the teeth.

Included in the equipment of the maintenance crews were two General Electric, one Westinghouse, and one Lincoln welders. Two of these were portable, and breaks were welded on-the-job wherever possible.

A similar maintenance system was used for the hauling equipment, with crews of about 20 men keeping all units oiled and greased and in perfect repair with a minimum of loss of operating time. Part of the smooth flow achieved in the operations was due to a dispatcher who was in entire charge of the disposition of the hauling equipment and kept it routed for maximum efficiency.

Complete Repair Shop Speeds Work

Repairs which could not be handled on the job were made in the completely equipped shop on the east bank of the river. This shop was a steel building about 75 by 150 feet, served by a 10-ton crane whose runway also extended out into a storage yard.

The shop had lathes, millers, shapers, blacksmith and babbitting departments, steam hammer, bending rolls, punch and shears, 250-pound hydraulic press, and complete welding equipment. It could handle repairs, construction of most necessary parts, and even of some complete machines.

A considerable maintenance problem was offered by the dust clouds which were common both inside and outside the excavation area. Special air cleaners were installed in the gas and diesel shovels, but no satisfactory method could be found for cleaning the electric shovel motors while they were operating. Consequently, they were left until the short idle period between cleaning up the west side excavation and beginning large scale operations on the east side. At this time, the motors were taken down and given a thorough cleaning.

Sub-contract for East Bank

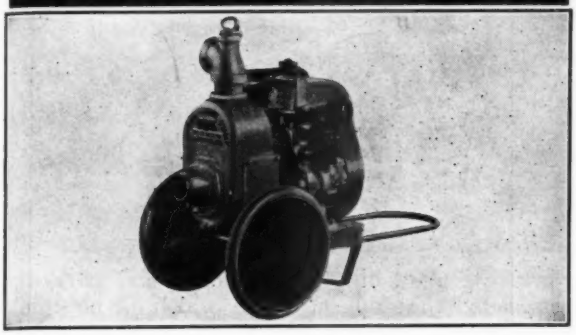
While MWAK forces were gunning ahead on the west excavation, Guy F. Atkinson, Inc., was supplementing their work under a sub-contract for removing 1,481,000 yards on the east bank. The work was handled by two Bucyrus-Erie 2-yard shovels, one 50-B and one 43-B, loading a fleet of 12-yard Macks which hauled to a spoil bank about 4,000 feet upstream. Beginning in August, 1935, however, the main conveyors belt was extended across the Columbia on a wooden pile trestle.

Extra excavation was made necessary by slides occuring in March, 1934 and January, 1935. This work was handled by MWAK, Crick & Kuney, David H. Ryan, and Goodfellow Brothers.

The following is a list of the

• Two slides provided extra work, and are a good indication of the "flowing" characteristics of the material handled. Here, a Crick & Kunney 43-B is adjusting a slope 400 feet above the west cofferdam to the angle of repose. A delicate job.

LOWER PRICE—LIGHTER WEIGHT
POSITIVE RECIRCULATION CUT-OFF



NEW REX 2″ and 3″ MODELS
7,000 and 15,000 G. P. H.

REX SPEED PRIME PUMPS—2″ to 6″
7,000 TO 90,000 G. P. H.

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REX *Construction Equipment*

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GOOD FOR YEARS OF HARD SERVICE

A HAYWARD Bucket is an investment, not a gamble. It helps you make a profit on every job.

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Long Range Digging at Lowest Cost

Sauerman Slacklines and Drag Scrapers are designed to dig and convey any distance up to 1,500 ft. at lowest cost per ton.

There is a type of Sauerman machine for under-water excavation, another for digging from a bank, another for stock-piling and reclaiming, and so on. Handling capacities range from 10 to 1,000 tons per hour.

SAUERMAN BROS.
474 S. Clinton St. Chicago

2 Good Reasons

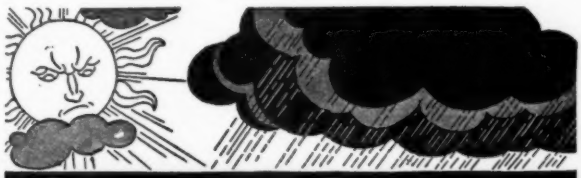
POWER AND EFFICIENCY
GO HAND IN HAND WHEN YOU ARE Gatke equipped

Gatke Moulded Asbestos Brake and Friction Blocks give more power to your steam shovels, draglines, dredges and hoists.

Smoother operation and accurate control assure longer life and more efficient all-around service.

We will cheerfully furnish complete information on Gatke Products upon request.

GATKE CORPORATION
228 N. La Salle St., Chicago



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UNEXCELLED FOR EXCAVATING, HANDLING AND ROAD BUILDING EQUIPMENT

GRADE 16 - A soft, very adhesive lubricant for cables, chains and sprockets.

GRADE 19 - A heavy, waterproof grease for open gears, especially under heavy pressures.

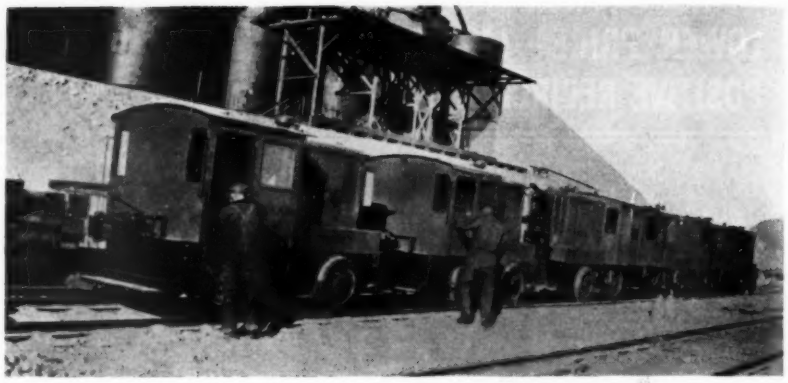
GRADE D51 - For power shovel or other open gears where dusty or dirty conditions prevail.

GRADE 42 - A semi-fluid lubricant for enclosed gears. Retains heavy body at high temperatures.

GRADE 52 - For grease cups, pressure fittings and general bearing lubrication.

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division, Cleveland, Ohio

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.



• Diesel locomotives pulled the cars containing the special concrete containers from the silos shown here. These six were built by Davenport and powered by Caterpillar.

excavating and hauling equipment used by MWAK:

2 Bucyrus-Erie 5-yard 120-B shovels
2 Marion 4-yard 4121 shovels
2 Marion 3-yard 4101 shovels
1 Bucyrus-Erie 2-yard 43-B Diesel shovel
1 Marion 2-yard 371 Diesel shovel
3 10-yard Linn caterpillar mounted trucks
2 4-yard Indiana trucks
10 10-yard White trucks
6 11-yard Mack trucks
20 7-yard Athey side-dump crawler wagons
1 33-yard Isaacson wagon
6 25-yard Woolridge wagons
23 Caterpillar 75s
2 Caterpillar 40s
3 Allis-Chalmers Model "LOs"

Other equipment used mainly for crane service included:

1 Bucyrus-Erie 50-B Diesel
1 Marion 371 gas
1 Marion 450 gas-electric
2 Thew-Lorrain gas

Successful Safety Efforts

In any job the size of the Grand Coulee project, and where so many men are employed, safety presents a problem needing constant attention. In addition to the hospital maintained in Mason City by the contractors, a knowledge of first aid was given to more than 4,000 workers by an expert from the Bureau of Mines. The same lectures and demonstrations were given here which were so effective in reducing the accident rate at Boulder Dam. Accident prevention work was and is effectively sponsored by the contractor through organized classes under direction of an experienced safety director.

Safety posters and rules in prominent locations provided constant reminders of the ever-present necessity for carefulness. In some cases, machine operators were subject to severe penalties for violating the established safety rules.

As a result of the efforts expended, the accident rate at Grand Coulee has been kept low.

Ahead of Schedule—and Still Gaining

When the center of excavation had shifted from the west cofferdam area to the east, the business of pouring concrete in the former went right ahead. This, too, is a separate story which space compells us to omit.

At present, MWAK is 6 months ahead of schedule, and making a definite bid for the record set when Boulder Dam was completed 26 months before the allotted time had elapsed. The smoothness and speed with which the work is progressing is excellent evidence of clear planning and carrying out of plans which is not only competent but possessed of a vigor and spirit which can only be found where men have a keen interest in the thing they are creating.

Work at Grand Coulee is under the supervision of the Bureau of Reclamation. R. F. Walter is chief engineer, F. A. Banks, project engineer, J. H. Miner, office engineer, and A. F. Darlander, field engineer.

For the Mason-Walsh-Atkinson-Kier Company, George H. Atkinson is job manager, M. H. Slocum, general superintendent; C. D. Riddle, chief engineer. Frank Smith was excavation superintendent, assisted by Stan Young, Bill Ellis and Walt Hill as shift superintendents, Louis Armstrong as rock superintendent, and C. E. Ferguson as shovel master mechanic.

These men and their assistants have not only proved themselves capable at their specific jobs, but able in cooperating so as best to forward the work as a whole. Because so many have had a share in building the fine record at Grand Coulee, it is difficult to give credit wherever it is due. It is certain, however, that the magnitude of the project is being matched by the work of the men who are constructing it.

The next big step in the construction of this great dam is the diversion of the Columbia River, for which equipment is now being assembled.

• Material dumped through grizzlies fell on rugged apron conveyors like this. These "receiving" sections were moved as the excavation progressed—even making the jump across the Columbia when necessary.

Trade Notes

Chicago Pneumatic Tool Company announces the opening of a new sales and service branch at 2415 Commerce Street, Dallas, Texas, effective June 1st, 1936. This branch will be in charge of Mr. D. G. Reeder, District Manager.

Effective June 1st, 1936, the address of the Pittsburgh, Pennsylvania office of the Chicago Pneumatic Tool Company will be 810 Chamber of Commerce Building, Pittsburgh, Pennsylvania.

The Corrugated Steel Sheet Piling Corporation recently took over the steel sheet piling department of the Youngstown Pressed Steel Company at Warren, Ohio; and the business of the National Piling Exchange, Chicago. The new company's address is 228 N. LaSalle Street, Chicago.

The Lincoln Electric Company of Cleveland, Ohio, recently appointed the Intermountain Belting and Packing Company as its agent to cover Colorado, part of Kansas, Nebraska and Wyoming. Salesroom is located at 1414 Wazee Street, Denver. A complete service will be maintained for every arc welding need, including a consultation service on any phase of welding, available without charge to those who use welding in the territory.

Book Reviews

A **"Bibliography on Foreman Improvement,"** containing a revised list of reference books, pamphlets and magazine articles dealing with ways to improve foremanship, has been published by the Department of the Interior. Copies may be obtained for 5 cents from the Superintendent of Documents, Washington, D. C.

Sullivan Machinery Company recently announced a new bulletin on their line of Unitair compressors.

The Unitair is a two-stage, completely air cooled, V-type, single acting stationary compressor incorporating many advanced features in compressor design. It is available in four sizes to 400 C. F. M. displacement and for any kind of drive.

Copies of the bulletin may be obtained from the Sullivan Machinery Co., Michigan City, Indiana.

"Getting Acquainted with Minerals" (McGraw-Hill, $2.50) by George Letchworth English. Although written by a consulting mineralogist of wide reputation, this book has been slanted quite definitely for the lay reader, yet without sacrificing scientific accuracy. The amateur collector of mineralogical specimens will find this work of practical value in seeking out, identifying and cataloging his specimens. The text is profusely illustrated and contains valuable tables for the determination of minerals.

Chain Belt Company, Milwaukee, Wis., recently issued four illustrated booklets describing the **Rex line of construction equipment** for 1936. These booklets cover the 3½-S and 5-S mixers, the 7-S and 10-S mixers, the 14-S mixer, and the 27-E paver. Specifications of models illustrated are given. Copies of any or all of the four booklets may be obtained by writing the manufacturer.

A dry method of fire extinguishment is thoroughly described in a booklet recently published by the **Garrison Engineering Corporation**, Great Barrington, Mass. The booklet deals concisely with the meaning and causes of fire, and explains how to go about control of the various types of fires.

A 36-page illustrated booklet devoted to mixers has been published by the **Jaeger Machine Company**, Columbus, Ohio. The complete line is covered, various sizes and types being illustrated and described. Specifications are given.

Worthington Pump and Machinery Corporation, Harrison, New Jersey, has issued a 4-page folder on its vertical turbine pumps for cofferdam dewatering and mine sinker service. A cross-section diagram illustrates the features of the pumps, and a table of ratings is included.

The Riveting of Aluminum is the title of a booklet issued by the **Aluminum Company of America**, Pittsburgh, Pa. Complete details of proper sizes, characteristics and procedure in selecting and handling rivets are given in descriptive text and in tables.

The Cleveland Tractor Company, Cleveland, Ohio, recently issued a number of "Cletrac Facts" devoted to tractors and carrying scrapers. Many installations are illustrated, views which show best methods of handling the equipment having been chosen. Descriptive text with each picture supplements the information.

The Austin-Western Road Machinery Company has issued an illustrated bulletin covering its line of Road Rollers and Roll-A-Planes. The desirable characteristics for rollers are discussed, advantages of this equipment illustrated by photographs and charts. Dimensions of machines are given. Copies of the booklet may be obtained by writing the manufacturer at Aurora, Ill.

Help Wanted

MASTER MECHANIC

who thoroughly understands operation and maintenance of gasoline or steam cranes and kindred equipment. Applicant must be capable of taking full charge, including hiring of men, responsibility for the efficient maintenance and operation of fleet of twenty to thirty machines, come well recommended and have a satisfactory record of experience. Chicago territory. Reply giving age, experience, and last salary.

Box 8202

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

EXPERIENCED OPERATOR

Experienced shovel-dragline-crane - clamshell operator desires work anywhere, preferably in foreign country. Twenty years' experience includes work on gas, electric, Diesel and steam machines. Can do own repair work. Best of references. Present location West Virginia.
Box 8006.

DRAGLINE OPERATOR

Operator experienced on levee, revetment and drainage work desires work on Bucyrus-Erie steamer, any size. Seventeen years on dragline, two on clamshell and one on crane. One year each on gasoline and Diesel machines. Can do own repair work. Will go anywhere in U. S. Age 36; married. A-1 references furnished. Located in Missouri. Box 8107.

SHOVEL-DRAGLINE OPERATOR

Experienced shovel and dragline operator, 10 years on gasoline and Diesel machines on highway, railroad, mining, power dam and river work desires position on railroad or dam construction operating gas or Diesel machine any size. Can operate dredge. Willing to go anywhere. Age 34; married. Can do own repair work. A-1 references. At present located Upper Michigan. Box 8104.

STEAM SHOVEL OPERATOR

Have 25 years' experience on steam machines on all kinds of construction work. Desire position on any make, size or type steam shovel; anywhere. Can do own repair work. Best references furnished. Age 50. Married. At present located in Missouri. Write Box 8105.

SUPERINTENDENT

Graduate mine engineer wishes responsible position as superintendent of sand, gravel or rock operation. Accustomed to handling large tonnage operations employing large forces of men at low costs. Has twenty years experience in this line of work. Can furnish best of references and can assume complete charge. Age 42. Married. Box 8201

STEAM SHOVEL OPERATOR

Twenty years' experience on steam shovels on contracting and railroad work qualifies me to operate your steam machine. Age 44; married. References. Now located Southern Idaho. Box 8102

OPERATOR

12 years' experience on steam shovels, locomotives, cranes, clamshells. Can do own repairing. Willing to go anywhere. 30 years old and single. First class references. Now located in New York. Box 8106.

SHOVEL OPERATOR

Operator—10 years' experience on shovel, dragline and clamshell—on general excavation and mining—desires work on any make and type machine. Can do own repair work. Will go anywhere. Age 40; single. Best of references. Present location near Chicago. Box 8001

DRAGLINE OPERATOR

Experienced crane and dragline operator wishes work preferably on Bucyrus dragline or piledriver. Has operated steam and gasoline machines for 15 years. Willing to go anywhere in U. S. Can do own repair work. Age 39; married. Good references. Located near Chicago. Box 8002

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.

COMPLETE FRONT END EQUIPMENT

Shovel Equipment

½ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

⅝ CU. YD. DIPPER, 12'6" dipper handle, 16' boom. Shovel equipment suitable for type "A" shovel. NEW. SE-31.

¾ CU. YD. DIPPER—23' BOOM—12'6" DIPPER HANDLE—Shovel Equipment suitable for 20-B Gas or Diesel. NEW. SE-15.

¾ CU. YD. DIPPER 25'9" BOOM—14' DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. NEW. SE-17.

¾ CU. YD. DIPPER—20'6" BOOM, 17' DIPPER HANDLE, high lift shovel equipment suitable for 20-B steam. NEW. SE-32.

⅞ CU. YD. DIPPER—21'9" BOOM and ENGINE — 15' DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. NEW. SE-18.

1 1 CU. YD. DIPPER—26' boom, 17' handle Shovel equipment—Will fit 30-B. SE-35.

1½ CU. YD. DIPPER—27' BOOM—17' DIPPER HANDLE—High Lift Rope Crowd Shovel Equipment suitable only for Bucyrus-Erie 43-B machines. Rebuilt—New Machine Guarantee. SE-23.

1 1¾ CU. YD. DIPPER, 30' boom, 19' handle, high lift steam shovel equipment—Will fit 50-B. New. SE-33.

1 1¾ CU. YD. DIPPER, 22' boom, 16' handle, shovel equipment—Will fit 43-B. New. SE-34.

Skimmer Scoop

⅝ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

Dragline Equipment

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. Used. DL-3.

BRAND NEW Ropes included with each of above Complete Equipments.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clamshell or Dragline. Rebuilt—New Machine Guarantee. DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1
1 7'10½" 20-B TUNNEL (two sticks). New. H-2.
1 9'6" 31-B TUNNEL (two sticks). New H-3.
3 9'6" 30-B TUNNEL (two sticks each). New. H-4.
1 9'6" 20-B TUNNEL (two sticks). New. H-5.
1 9'6" 31-B TUNNEL (two sticks). New. H-6.
1 12'6" 18-B—Complete. New. H-7.
1 12'6" D-2, 31-B—Complete. New. H-8.
1 12'6" D-2, 31-B—Complete. New. H-9.
1 13'0" 1020—Complete. New. H-10.
3 15'0" E-2 41-B—Complete. New. H-13.
1 16'0" TYPE "A"—Complete. New. H-16.
1 16'0"—43-B—Complete. New. H-17.
1 17'0"—TYPE "A"—Complete. New. H-18.
1 17'0"—20-B HIGH LIFT—Complete. New. H-19.
1 17'0"—37-B—Complete. Used. H-21.
1 17'0"—50-B OIL (two sticks). New. H-23.
1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—15'0" 1030 CHAIN CROWD SHOVEL BOOM—Used. JA-32.
4—18' 20-B STEAM SHOVEL BOOM—New JA-2.
1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-23.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-33.
1—20'0" 1030 CHAIN CROWD SHOVEL BOOM—New. JA-24.
2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.
1—21'3" Type "B" Bar Boom—New. JA-37.
1—21'6" 37-B CHAIN CROWD SHOVEL BOOM—New. JA-26.
1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.
2—22'0" 43-B CHAIN CROWD SHOVEL BOOM—Used. JA-27.
3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.
1—23'6" 37-B ROPE CROWD SHOVEL BOOM—New. JA-28.
1—24'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-29.
1—24'0" GA-2 DRAG SHOVEL BOOM—New. JA-30.
1—24'0" GA-2 DRAG SHOVEL BOOM—Used. JA-34.
1—24'0 GA-3 DRAG SHOVEL BOOM—New. JA-35.
1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.
2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.
1—25'0" 37-B ROPE CROWD SHOVEL BOOM—Used. JA-36.
1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.
1—26' 20-B DIESEL SHOVEL—New. JA-11.
2—26' D-2 SHOVEL BOOM—New. JA-13.
1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.
3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.
1—27'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-31.
1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.
3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.
1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.

DIPPERS

Small Machines

3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

2 ⅝ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

1 ¾ CU. YD.—Rock Type—Will fit 20-B New. D-67.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 41-B, 42-B, E-2. New. D-44.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 41-B, 42-B, E-2. Used. D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-52.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

1 1½ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will fit 43-B. Used. D-39.

3 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 ⅝ CU. YD. ROCK—Will fit 20-B. New. D-64.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

1 3 CU. YD.—2½" Molybdenum cast steel front, wo part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front, two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

1 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molybdenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

DIPPER TRIPS

1—30-B STEAM DIPPER TRIP—New. DT-1.

1—31-B STEAM DIPPER TRIP—New. DT-2.

4—50-B STEAM DIPPER TRIPS—New DT-4.

BUCKETS

Dragline

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

2 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-16.

1 3 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 7 CU. YD.—MONIGHAN TYPE "W". 1370 lbs. New DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAM-SHELL BUCKET without teeth and counter-weight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR — GENERAL ELECTRIC — 3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

TANKS

Water

5—260 GALLON 41⅞"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—200 GALLON 36½"x20 1/16"x6'3" high. Elliptical—¼" steel plates. T-2.

1—283 GALLON 54⅜"x17⅝"x6'4". ¼" Steel plates. T-3.

Oil

4—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47¼" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". ¼" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

6—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. (1 copper brazed and 5 soldered) T-9.

Air

2—5 CU FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—6 cylinder, 9" bore x 10½" stroke, 514 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

1 46½"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

2 44'x17'—75 H.P. 125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

1—76"x12'—136 H.P. 175 lb. Working Pressure. ASME and Mass. Std. Will fit 120-B. B-18.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

FOR SALE

RATES

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Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL SHOVELS
Under 2 Yards

⅜-YARD

BUCYRUS-ERIE 10-B DIESEL DRAGLINE, 25 foot boom, long cat. Long side frames—20" treads. ⅜ yard AU drag bucket. Buda four cylinder 3¾"x4½" Diesel engine with Excello fuel pump and fuel supply pump with filter. Kohler 800 watt light plant. Used as demonstrator. New machine guarantee. Located New York. Box 861-SS.

INSLEY — TYPE C — GASOLINE SHOVEL. Engine recently rebored and reconditioned. Machine generally in good operating and mechanical condition. Equipped with Buda type KTU Diesel engine. Located Arkansas. Box 814-SS.

INSLEY Type C Combination Shovel and Skimmer Scoop. Buda 4-cylinder 4"x5½" Type KTU Engine. Field reconditioned. Excellent condition. Located Georgia. Box- 834-SS.

INSLEY COMBINATION GASOLINE SHOVEL AND DRAGSHOVEL—⅜ cubic yard. Located Massachusetts. Box 847-SS.

UNIVERSAL-UNIT ¾-swing combination ⅜ cu. yd. gasoline shovel and 30-foot boom dragline, including ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

½-YARD

BAY CITY MODEL K-2 half yard gas shovel. Box 862-SS.

BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

P & H MODEL 300-A DIESEL SHOVEL and clamshell 18' boom—13' dipper handle—⅝ yard dipper—17" cat treads. 38' plus 5' extension clamshell boom. No bucket. Cat Diesel three cylinder D-6100 engine. Located Northern Florida. Box 863-SS.

THEW TYPE S electric mining crawler shovel, ½-yard bucket, 20 h.p. and 12 h.p. Otis motors. Located in Minnesota. Box 832-SS.

⅝-YARD

P&H MODEL 300 SHOVEL—18' Boom, 15' Dipper Handle, ⅝ cubic yard Dipper, manganese front. Powered with Waukesha B U 4½"x6¼" engine, power clutch control. First class operating condition. Located Massachusetts. Box 663-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE—TYPE B—Combination shovel and 40' boom crane. Boiler reflued and the machine in fair operating condition. Located Arkansas. Box 815-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B CATERPILLAR MOUNTED, HIGH LIFT STEAM SHOVEL. Good operating condition. Located Connecticut. Box 775-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper — Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL 21'3" Boom, 18'4" Dipper Handle. ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist — Boiler Feed Pump — Caterpillar Mounted. Located Chicago. Box 699-SS.

BUCYRUS-ERIE 1030 GAS SHOVEL AND CLAMSHELL. 23' shovel boom, 15' dipper handle—¾ yard dipper. Rope crowd. 40' clamshell boom. No bucket. Wisconsin B-3 gas engine. Located Kentucky. Available about August 1. Box 864-SS.

BUCYRUS-ERIE TYPE B high lift steam shovel and 40' clamshell boom including front drum and gearing. Good working condition. Located Eastern Pennsylvania. Low price. Box 865-SS.

KOEHRING MODEL 301 ¾ yard gas shovel. Wisconsin 5"x6" engine. Good working condition. Located Louisville, Kentucky. Box 866-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ YARD SHOVEL. Good condition. Located eastern Pennsylvania. Box 725-SS.

NORTHWEST MODEL 3 GASOLINE CABLE CROWD—FEATHER TOUCH CONTROL—SHOVEL. Good operating condition. Located Chicago. Box 798-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel— Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

OSGOOD AIR TUNNEL SHOVEL. 13' boom, 8' dipper handle—¾ yard dipper. Located Western New York State. Box 867-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wisconsin

⅞-YARD

MARION MODEL 21 — ⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom, 16' Dipper Handle, ⅞ cubic yard inserted tooth Dipper. Two speed propelling gear. Located Boston. Box 716-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 21'3" Boom—16' Dipper Handle— ⅞ cu. yd. inserted tooth Dipper. Good operating condition. Located Boston, Mass. Box 853-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom— 16' Dipper Handle— ⅞ cu. yd. Dipper. Located near Boston, Mass. Box 854-SS.

1-YARD

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

BUCYRUS-ERIE GA-2 GAS-AIR ONE YARD SHOVEL and 40' boom lifting crane. Single shaft cat. Waukesha four cylinder 5¾"x8" gas engine. Excellent condition. Located Eastern Pennsylvania. Box 895-SS.

BUCYRUS-ERIE B-2 AIR TUNNEL SHOVEL. 14'6" boom, 10'9" dipper handle—⅞ yard dipper. Located Ohio. Box 869-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Waukesha four cylinder 5¾"x8" engine. Overhauled approximately one year ago. Good operating condition. Located Knoxville, Tennessee. Box 870-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Electric starter. Waukesha four cylinder 5¾"x8" gas engine. Located Louisville, Kentucky. Box 871-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 24' boom—16' dipper handle—one yard dipper. Single shaft cat. Electric starter. Waukesha 5¾"x8" four cylinder engine. Good operating condition. Located Boston. Box 875-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. Boiler A-1 shape. Main machinery overhauled last year. Practically new boom with engine. Located near Duluth, Minnesota. Box 794-SS.

BUCYRUS-ERIE GA-2 1-yard dipper. Mounted on caterpillars. Located in Minnesota. Box 831-SS.

BUCYRUS-ERIE 30-B STEAM SHOVEL. Located St. Louis, Missouri. Box 817-SS.

BUCYRUS-ERIE GA-2 — Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

MARION MODEL 7 ONE-YARD STEAM SHOVEL, equipped with Model 450 boiler. Located Scranton, Pennsylvania. Box 873-SS.

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

P & H MODEL 600 ONE YARD GAS SHOVEL. Just recently overhauled. Excellent condition. Located eastern Pennsylvania. Box 855-SS.

P & H MODEL 600—1 yd. Gasoline Shovel—including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

P & H MODEL 600 GAS SHOVEL AND CLAMSHELL, 19'3" boom—14'3" dipper handle one yard dipper—40' clamshell boom—1½ yard rehandling clamshell bucket. Rebuilt 1933. Excellent condition. Located Kentucky. Box 874-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wisconsin

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION SHOVEL AND DRAGLINE. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Inserted Tooth Dipper. 45' Boom. Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Oklahoma. Good operating condition. Box 703-SS.

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—14' dipper handle 1¼ yard dipper. Single shaft cat. Steel cab. Electric starter. Waukesha four cylinder 6¼"x8" engine. First class condition. Located Texas. Box 876-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—1¼ yard dipper. Electric starter. Single shaft cat. Very good condition. Located New Hampshire. Box 880-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. Wisconsin D-2 gas engine—suitable 4000' altitude. Located Texas. Box 881-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. D-2 Wisconsin gas engine. Very good condition. Located New Mexico. Box 882-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Electric starter. Single shaft cat. Steel cab. Waukesha four cylinder 6¼"x 8" engine. Splendid condition. Located Mississippi. Box 883-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL AND CLAMSHELL, 22'6" shovel boom—16' dipper handle—1¼ yard dipper—50' clamshell boom and equipment. Electric starter. Steel cab. D-2 Wisconsin six cylinder 5¼"x6½" gas engine. Box 884-SS.

BUCYRUS-ERIE 34-B GAS SHOVEL, 20' boom—16' dipper handle 1¼ yard dipper. Electric starter. Wisconsin six cylinder 5½x6½ engine only used about six months. Excellent condition. Located Connecticut. Box 885-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL. 21' boom—15' dipper handle—1¼ yard inserted tooth dipper—dipper trip. Boiler lagged. Located New York. Box 896-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL-CLAMSHELL-PILE DRIVER. 21' shovel boom 15' dipper handle—1¼ yard rock dipper 45' boom clamshell equipment—pile driving leads. Good operating condition. Available about November 1. Located New York. Box 897-SS.

BUCYRUS-ERIE 37-B GAS SHOVEL. 21'6" boom 15' dipper handle. 1¼ inserted tooth dipper—electric starter. Standard single shaft cat. Very good operating condition. Located Connecticut. Box 899-SS.

BUCYRUS-ERIE 37-B Gasoline Shovel. 23' Boom 17' Dipper handle. 1¼ cubic yard dipper. Chain Crowd. Wisconsin D-3 6-cylinder 5½"x6½" Engine. Reconditioned. Excellent condition. Located Vicinity of New York. Box 840-SS.

BYERS-MASTER 1¼ YARD GAS SHOVEL. Hercules four cylinder engine. Good operating condition. Located Eastern Pennsylvania. Box 898-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Field reconditioned. Available about August 15. Located New Mexico. Box 879-SS.

LIMA MODEL 101 GAS SHOVEL—21' boom 17' dipper handle—1¼ yard dipper. Located Eastern Pennsylvania. Box 886-SS.

LORAIN 75-A 1¼ YARD GAS SHOVEL. Reported good condition—will sell on terms. Located Memphis, Tennessee. Box 887-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

LORAIN MODEL 75—1¼ YD. SHOVEL. 21'0" boom, 14' dipper handle. Also 45' plus 15', total 60', dragline boom and equipment, and 1¼ cu. yd. Page "M" dragbucket. Engine—Waukesha WL 6-cylinder 6¼"x8" gasoline. Located—Denver, Colorado Box 806-SS.

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

MARION MODEL 450 1¼ DIESEL SHOVEL. Located Eastern Pennsylvania. Box 889-SS.

MARION MODEL 450 ELECTRIC SHOVEL. 1¼ yard AC-DC 3 phase, 60 cycles, 440 volts. Located Eastern Pennsylvania. Box 890-SS.

P & H MODEL 650 SHOVEL. 23' boom—16' dipper handle—1¼ yard dipper. Electric starter. Split second control. Waukesha four cylinder 6¼"x8" engine. Field reconditioned. Available about August 15. Located Milwaukee. Box 878-SS.

1½-YARD

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL. 26' boom 15' dipper handle—1½ yard dipper. Good repair and operating condition. Located Boston. Box 891-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL AND DRAGLINE. 27' shovel boom 15' dipper handle—1½ yard dipper—50' dragline boom and equipment—no bucket—Kohler light plant. Atlas four cylinder 7½"x10½" engine. Box 892-SS.

BUCYRUS-ERIE 43-B GAS SHOVEL AND DRAGLINE. 23' shovel boom—17' dipper handle—1½ yard dipper 50' boom dragline equipment. No bucket. Electric starter. Wisconsin Model E-six cylinder 6"x7" gas engine. Excellent condition. Located Eastern Pennsylvania. Box 893-SS.

TWO LORAIN 75-B COMBINATION 1½ CUBIC YARD SHOVEL AND 50' BOOM DRAGLINES — without buckets. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Wisconsin. Box 760-SS.

P & H MODEL 700—1½ CU. YD. GASOLINE SHOVEL. Engine: Waukesha 4-cyl. 7½"x8" Engine. Fair working condition. Located New Mexico. Bargain price. Box 789-SS.

1¾-YARD

BUCYRUS-ERIE 42-B CHAIN CROWD SHOVEL AND CLAMSHELL MACHINE. 22' Shovel Boom—16' Dipper Handle—1¾ yd. Dipper. 50' Boom Clamshell Equipment—no Bucket. Wisconsin Gasoline Engine. First-class operating condition. Located New York City. Box 856-SS.

BUCYRUS-ERIE—50-B—DIESEL SHOVEL. 38' Boom, Two 19' Dipper Handles. 1¼ Cubic Yard Rock Bucket and 1¾ Cubic Yard Dirt Bucket. 60' Boom Dragline Equipment without bucket included. Shovel only located Montana. Dragline equipment located Minnesota. Box 785-SS.

BUCYRUS-ERIE 50-B, 1¾ yard steam shovel, steel cab, may be inspected. Located Minnesota. Box 827-SS.

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

⅜-YARD SARGENT SCOUT DRAGLINE. Powered with McCormick-Deering Model 200 4-cylinder 4¼x5 heavy duty gas engine. Cable speed 160 fpm, single line. Two traveling speeds. Capacity as crane from 8000 lbs. at 8 ft. radius to 2800 lbs. at 24 ft. radius. Iowa. Box 772-SD.

UNIVERSAL-UNIT ⅜ swing combination 30-foot boom gasoline dragline and ⅜ cu. yd. shovel. ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SD.

1-YARD

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM DRAGLINE. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE D-2 DIESEL DRAGLINE including 1¼ yd. Page RS drag bucket. Located Texas. Box 868-SD.

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air starter. Good condition. Located Newark. Box 718-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SD.

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION DRAGLINE AND SHOVEL. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Inserted Tooth Dipper. 45' Boom—Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Oklahoma. Good operating condition. Box 703-SD

BUCYRUS-ERIE 34-B DIESEL DRAGLINE. 45' boom—Atlas six cylinder 6¼"x8" engine. Standard single shaft cat. No bucket. Used approximately one year. Field reconditioned. Located San Francisco. Available about Sept. 1. Box 877-SD.

LORAIN 75 GAS—50' BOOM DRAGLINE. No bucket. Waukesha four cylinder 6¾"x8" engine. Reported excellent condition. Located Eastern Pennsylvania. Box 888-SD.

1½-YARD

LORAIN 75-B DIESEL 55' BOOM DRAGLINE. No bucket. Good operating condition. Located Eastern Pennsylvania. Box 894-SD.

2 LORAIN 75-B COMBINATION DRAGLINES AND SHOVELS. 50' dragline booms without buckets. 1½ cubic yard shovel equipment. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

½-YARD

BYERS BEARCAT CLAMSHELL—Crane—30' boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

ORTON 24' BOOM—½ CUBIC YARD CLAMSHELL MACHINE. ½ cubic yard Owen Clamshell Bucket. Hercules 55 HP. Gasoline Engine. Factory rebuilt 1932. Good operating condition. Located Tennessee. Box 709-SCC.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM CLAMSHELL—DRAGLINE—SHOVEL. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SCC.

O & S MODEL "T" ¾ yard clamshell machine. 40' boom. Good working condition. Powered with Climax 5½"x7" gasoline engine. Located near St. Louis. Good working condition. Box 651-SCC.

1-YARD

BUCYRUS-ERIE GA-2—45' BOOM CRANE. Waukesha gas engine. First class operating condition. Located Tennessee. Box 816-SCC.

1¼-YARD

1¼ YD. OSGOOD MODEL 2498 GAS, 40' boom. Clamshell equipment including bucket. Excellent operating condition. Favorable price. Located Springfield, Ohio. Box 859-SCC.

NORTHWEST MODEL 105 Gasoline—40' boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

1½-YARD

OSGOOD "VICTOR" 50' BOOM CLAMSHELL MACHINE AND 1½ CUBIC YARD SHOVEL. Gasoline Power. Good operating condition. Located Wisconsin. Box 760-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

1½-W MONIGHAN WALKER. Diesel power. 2 yard capacity. 60-foot boom Good condition Reasonably priced. Located Kansas. Box 742-LSD.

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL-DRAGLINE. 26' boom, 17' dipper handle, 2 cubic yard dipper. 60' boom dragline equipment including 2 cubic yard Page Class M bucket and steam operated lighting plant. Machine can be placed in operation quickly with installation few small parts. Very attractive price. Located Alabama. Box 842-LSD.

2-W MONIGHAN WALKER 3½ yard capacity. 70-foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads. Louisiana. Box 751-LSD.

TYPE 175-B ELECTRIC, No. 794 equipped with 87' shovel boom, 48' dipper handle, 3½-yd. bucket, and dragline equipment including 125' boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present, location, Connecticut. Box 263-LSD.

100-B STEAM SHOVEL, 3 yd. dipper, location Eastern Canada. Immediately available. Used—good condition. Box 669-LSD.

100-C BUCYRUS STEAM SHOVEL on trucks, 3½-yard dipper. New 1914. Willing to sell very cheap. Located near Allentown, Pa. Box 807-LSD.

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

PAGE DRAGLINE, track mounted, 90-foot boom, 3½-yard Page RC bucket with new 150 h.p. Venn-Severin Diesel engine. Thoroughly overhauled and rebuilt in 1935. Now working in Indiana. Box 768-LSD.

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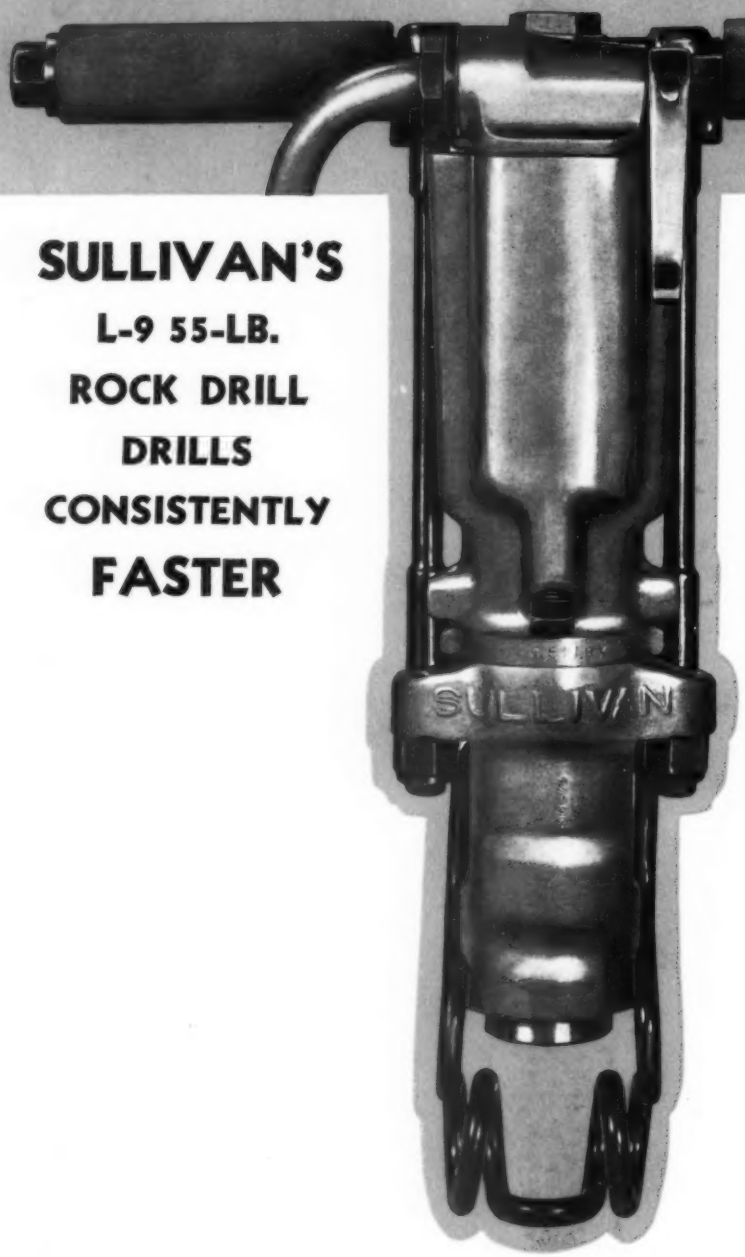

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